Summary of Safety and Clinical Performance (SSCP)

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 Splashwire Hydrophilic Guide Wire.

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

The English version of this SSCP document (SSCP 0092-002) has been validated by the Notified Body (NB). The following information is intended for users/healthcare professionals. Since the Splashwire Hydrophilic Guide Wire is not a long-term implant device, a patient-directed SSCP is not required.

1.0 Device Identification and General Information

1.1 Device trade name

The Splashwire Hydrophilic Guide Wire model numbers covered by this SSCP are presented in Table 1.

Table 1. Splashwire Hydrophilic Guide Wire Product Codes and Configurations

Catalog Number	Diameter	Length	Tip Shape	Configuration
MSWSTDA18150/EU	0.018 in (0.46 mm)	150 cm (59 in)	Angled	Standard
MSWSTDA18180/EU	0.018 in (0.46 mm)	180 cm (71 in)	Angled	Standard
MSWSTDA18260EX/EU	0.018 in (0.46 mm)	260 cm (102 in)	Angled	Standard Exchange
MSWSTDA1880/EU	0.018 in (0.46 mm)	80 cm (31.5 in)	Angled	Standard
MSWSTDA25150/EU	0.025 in (0.64 mm)	150 cm (59 in)	Angled	Standard
MSWSTDA25180/EU	0.025 in (0.64 mm)	180 cm (71 in)	Angled	Standard
MSWSTDA25260EX/EU	0.025 in (0.64 mm)	260 cm (102 in)	Angled	Standard Exchange
MSWSTDA35150/EU	0.035 in (0.89 mm)	150 cm (59 in)	Angled	Standard
MSWSTDA35180/EU	0.035 in (0.89 mm)	180 cm (71 in)	Angled	Standard
MSWSTDA35220/EU	0.035 in (0.89 mm)	220 cm (87 in)	Angled	Standard
MSWSTDA35260EX/EU	0.035 in (0.89 mm)	260 cm (102 in)	Angled	Standard Exchange
MSWSTDA3580/EU	0.035 in (0.89 mm)	80 cm (31.5 in)	Angled	Standard
MSWSTDA38120/EU	0.038 in (0.97 mm)	120 cm (47 in)	Angled	Standard
MSWSTDA38150/EU	0.038 in (0.97 mm)	150 cm (59 in)	Angled	Standard
MSWTDA38180/EU	0.038 in (0.97 mm)	180 cm (71 in)	Angled	Standard
MSWSTDA38260EX/EU	0.038 in (0.97 mm)	260 cm (102 in)	Angled	Standard Exchange
MSWSTDA3880/EU	0.038 in (0.97 mm)	80 cm (31.5 in)	Angled	Standard

Catalog Number	Diameter	Length	Tip Shape	Configuration
MSWSTDS18150/EU	0.018 in (0.46 mm)	150 cm (59")	Straight	Standard
MSWSTDS18180/EU	0.018 in (0.46 mm)	180 cm (71 in)	Straight	Standard
MSWSTDS18260EX/EU	0.018 in (0.46 mm)	260 cm (102 in)	Straight	Standard Exchange
MSWSTDS25150/EU	0.025 in (0.64 mm)	150 cm (59 in)	Straight	Standard
MSWSTDS25180/EU	0.025 in (0.64 mm)	180 cm (71 in)	Straight	Standard
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MSWSTDS3580/EU	0.035 in (0.89 mm)	80 cm (31.5 in)	Straight	Standard
MSWSTDS38150/EU	0.038 in (0.97 mm)	150 cm (59 in)	Straight	Standard
MSWSTDS38180/EU	0.038 in (0.97 mm)	180 cm (71 in)	Straight	Standard
MSWSTDS38260EX/EU	0.038 in (0.97 mm)	260 cm (102 in)	Straight	Standard Exchange
MSWSTFA35150/EU	0.035 in (0.89 mm)	150 cm (59 in)	Angled	Stiff
MSWSTFA35180/EU	0.035 in (0.89 mm)	180 cm (71 in)	Angled	Stiff
MSWSTFA35220/EU	0.035 in (0.89 mm)	220 cm (87 in)	Angled	Stiff
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MSWSTFA38150/EU	0.038 in (0.97 mm)	150 cm (59 in)	Angled	Stiff
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MSWSTFA3880/EU	0.038 in (0.97 mm)	80 cm (31.5 in)	Angled	Stiff
MSWSTFS35150/EU	0.035 in (0.89 mm)	150 cm (59 in)	Straight	Stiff
MSWSTFS35180/EU	0.035 in (0.89 mm)	180 cm (71 in)	Straight	Stiff
MSWSTFS35220/EU	0.035 in (0.89 mm)	220 cm (87 in)	Straight	Stiff
MSWSTFS35260EX/EU	0.035 in (0.89 mm)	260 cm (102 in)	Straight	Stiff Exchange
MSWSTFS3580/EU	0.035 in (0.89 mm)	80 cm (31.5 in)	Straight	Stiff
MSWSTFS38150/EU	0.038 in (0.97 mm)	150 cm (59 in)	Straight	Stiff
MSWSTFS38180/EU	0.038 in (0.97 mm)	180 cm (71 in)	Straight	Stiff

1.2 Manufacturer Information

The name and address of the manufacturer of the Splashwire Hydrophilic Guide Wire are provided in Table 2.

Table 2 Manufacturer Information

Manufacturer Name	Address of Manufacturer
Merit Medical Systems, Inc.	1600 West Merit Parkway South Jordan, Utah United States 84095

1.3 Manufacturer Single Registration Number (SRN)

The Single Registration Number (SRN) for the manufacturer is included in Table 3.

1.4 Basic UDI-DI

The basic Unique Device Identifier (UDI) with Device Identification (DI) key is provided in Table 3.

1.5 Medical Device Nomenclature Description / Text

The European Medical Device Nomenclature (EMDN) and Classificazione Nazionale dei Dispositivi medici (CND) codes and descriptors for the subject device are listed in Table 3.

1.6 Risk Class of Device

The EU device risk classification for the Splashwire Hydrophilic Guide Wire is listed in Table 3.

Table 3 Device Identification Information

Device Name	EU Device Class	Product Number	Basic UDI-DI	Single Registration Number (SRN)	EMDN/ CND Code	EMDN/ CND Terms
Splashwire Hydrophilic Guide Wire	III	MSWSTDA18150/EU, MSWSTDA18180/EU, MSWSTDA18260EX/EU, MSWSTDA1880/EU, MSWSTDA25150/EU, MSWSTDA25180/EU, MSWSTDA25260EX/EU, MSWSTDA35150/EU, MSWSTDA35180/EU, MSWSTDA35220/EU, MSWSTDA35260EX/EU, MSWSTDA3580/EU, MSWSTDA38150/EU, MSWTDA38180/EU, MSWSTDA38260EX/EU, MSWSTDS18150/EU, MSWSTDS18180/EU, MSWSTDS18260EX/EU, MSWSTDS25150/EU, MSWSTDS25180/EU, MSWSTDS25260EX/EU, MSWSTDS35150/EU,	0884450BUDI336PT	US-MF-000001366	C04020101	Peripheral Vascular Guidewires, Diagnostic, Hydrophilic

Device Name	EU Device Class	Product Number	Basic UDI-DI	Single Registration Number (SRN)	EMDN/ CND Code	EMDN/ CND Terms
		MSWSTDS35180/EU, MSWSTDS35260EX/EU, MSWSTDS3580/EU, MSWSTDA38120/EU, MSWSTDS38150/EU, MSWSTDS38180/EU, MSWSTDS38260EX/EU, MSWSTDA3880/EU MSWSTFA35150/EU, MSWSTFA35180/EU, MSWSTFA35220/EU, MSWSTDS35220/EU, MSWSTFA35260EX/EU, MSWSTFA3580/EU, MSWSTFA38150/EU, MSWSTFA38180/EU, MSWSTFA3880/EU, MSWSTFS35150/EU, MSWSTFS35180/EU, MSWSTFS35220/EU, MSWSTFS35260EX/EU, MSWSTFS3580/EU, MSWSTFS38150/EU, MSWSTFS38180/EU				

1.7 Year of EU Market Introduction

The year that the Splashwire Hydrophilic Guide Wire was first placed on the EU market is presented in Table 4.

1.8 Authorised Representative

The name of the authorized representative and the SRN are provided in Table 4.

1.9 Notified Body

The Notified Body (NB) involved in the conformity assessment of the Splashwire Hydrophilic Guide Wire in accordance with Annex IX or Annex X of the MDR and responsible for validating the SSCP is listed in Table 4.

1.10 NB Single Identification Number

The NB Single Identification Number is listed in Table 4.

Table 4 Authorized Representative and Notified Body Information

Device Name	Year Placed on EU Market	Authorized Representative		Notified Body (NB)	
		Name	SRN	Name	ID Number
Splashwire Hydrophilic Guide Wire	2020	Merit Medical Ireland Ltd.	IE-AR-000001011	BSI	2797

1.11 Intended Use

The Merit Hydrophilic Guide Wire is used to facilitate the placement of devices during diagnostic and interventional procedures.

1.12 Indications

The Merit Hydrophilic Guidewire is indicated for use in patients with disease and/or lesions of the peripheral vasculature or central circulatory system, excluding coronary arteries and cerebral vasculature.

1.13 Intended Patient Groups

Patients

The Merit Hydrophilic Guide Wire is designed for use during diagnostic and interventional procedures by trained physicians. Using their education and experience, the physician determines based on the individual patient, the appropriate guide wire to support the associated device(s) to be used during the procedure. The guide wire navigates the anatomy and facilitates placement of the associated device(s).

Physicians

For use by physicians trained in diagnostic and interventional radiology, cardiology, nephrology, and vascular surgery procedures.

1.14 Contraindications

The Merit Hydrophilic Guidewire should not be used in the coronary arteries or cerebral vasculature.

2.0 Device Description

Merit Medical hydrophilic guide wires are constructed from a high quality, steerable, metallic core wire with a polymer coating (Figure 1). The metallic core wire is utilized throughout the entire length of the wire body. The polymer coating (jacket) extends across the entire length of the guide wire surface. A hydrophilic coating is applied over the radiopaque polymer jacket. The hydrophilic coating extends across the entire length of the guide wire surface. The hydrophilic coating, when activated, provides lubricity across the entire polymer surface allowing the guide wire to navigate through the vasculature. Guide wires are supplied sterile and non-pyrogenic.

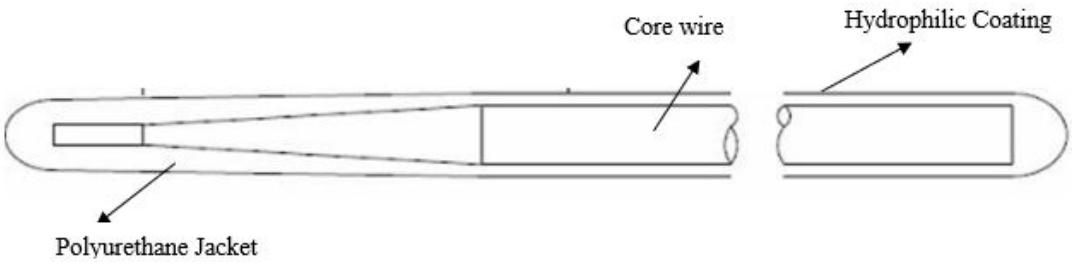

Figure 1. Splashwire Hydrophilic Guide Wire - Components

2.1 Materials/Substances in Contact with Patient Tissues

The materials or substances in the Splashwire Hydrophilic Guide Wire that may be in patient contact are summarized in Table 5. The Splashwire Hydrophilic Guide Wire device does not contain any medicinal substances.

Table 5. Splashwire Hydrophilic Guide Wire Materials in Contact with Patient Tissues

Component	Material Specification
Hydrophilic Coating	Hydrophilic Co-polymer Top-Coat • Copolymer of methyl vinyl ether and maleic anhydride • Poly(methyl-methacrylate) • Butanone • MEK- Methyl Ethyl Ketone • Methyl Acetate

The Splashwire Hydrophilic Guide Wire configurations are intended for single-use only and are provided sterile to the end user. The subject devices are not intended to be re-sterilized by the user. Merit utilizes ethylene oxide (EtO) sterilization for the Splashwire Hydrophilic Guide Wire.

2.2 Operating Principals

The Splashwire Hydrophilic Guide Wire is placed through a percutaneous sheath and advanced to the desired location according to the procedure planned by the clinician. It is used to facilitate the placement of devices during diagnostic and interventional procedures. Verification of guide wire placement is typically accomplished with fluoroscopy. Gaining access to the desired location in the vasculature with the guide wire is a function of the guide wire's material properties and the procedural skill and experience of the clinician using the device. The guide wire acts as a thin, manoeuvrable, element over which an associated device may be advanced and positioned.

The Splashwire Hydrophilic Guide Wire is commonly used in clinical practice over a wide range of specialties including interventional radiology. Guide wires are employed during procedures that require use of the 'Seldinger' or 'Modified Seldinger' techniques to place catheters and other devices in the vasculature. The technique is performed in either of two ways - the single method (or classical method) or the double-puncture method. A needle is inserted though one wall of the vessel (single method) until 'flashback' is obtained; the

needle is thus used to insert a guide wire which is advanced a short way up the vessel lumen. The needle can then be removed, and a dilator passed over the guide wire to allow a catheter to be advanced. At this stage, the guide wire can either be left in-situ or removed. With the double-puncture method, the needle is passed through both walls of the vessel to obtain flashback. In recent years, many specialties have adopted this technique and applied it for their own purposes.

2.3 Previous Generations or Variants

The Merit Laureate Hydrophilic Guide Wire is a previous generation/variant of the Splashwire Hydrophilic Guide Wire. The Laureate Guide Wire was launched by Merit in 2010. In 2014 Merit updated the coating and developed the Rev D version of the guide wire coating and followed this up with the Benzene Free version of the Rev D guide wire coating in 2017. In May 2020, Merit introduced the Rev F version of the Hydrophilic coating. In 2021 the Laureate Rev F wire was given a new brand name for the Rev F variant of the Coating and from now on will be known as “Splashwire.” This wire is identical to the Rev F guide wire except for the brand name and the catalogue code.

The Laureate Guide Wire is certified under MDD but not MDR; therefore, it does not have an associated UDI-DI. Model numbers for the Laureate Guide Wire are provided below (Table 6).

Table 6. Laureate Guide Wire Model Numbers

Catalog Number	Diameter	Length	Tip Shape	Configuration
Laureate Guide Wire (Rev D)				
LWSTDA18150/D	0.018 in (0.46 mm)	150 cm (59 in)	Angled	Standard
LWSTDA18180/D	0.018 in (0.46 mm)	180 cm (71 in)	Angled	Standard
LWSTDA18260EX/D	0.018 in (0.46 mm)	260 cm (102 in)	Angled	Standard Exchange
LWSTDA1880/D	0.018 in (0.46 mm)	80 cm (31.5 in)	Angled	Standard
LWSTDA25150/D	0.025 in (0.64 mm)	150 cm (59 in)	Angled	Standard
LWSTDA25180/D	0.025 in (0.64 mm)	180 cm (71 in)	Angled	Standard
LWSTDA25260EX/D	0.025 in (0.64 mm)	260 cm (102 in)	Angled	Standard Exchange
LWSTDA35150/D	0.035 in (0.89 mm)	150 cm (59 in)	Angled	Standard
LWSTDA35180/D	0.035 in (0.89 mm)	180 cm (71 in)	Angled	Standard
LWSTDA35220/D	0.035 in (0.89 mm)	220 cm (87 in)	Angled	Standard
LWSTDA35260EX/D	0.035 in (0.89 mm)	260 cm (102 in)	Angled	Standard Exchange
LWSTDA3580/D	0.035 in (0.89 mm)	80 cm (31.5 in)	Angled	Standard
LWSTDA38120/D	0.038 in (0.97 mm)	120 cm (47 in)	Angled	Standard
LWSTDA38150/D	0.038 in (0.97 mm)	150 cm (59 in)	Angled	Standard
LWSTDA38180/D	0.038 in (0.97 mm)	180 cm (71 in)	Angled	Standard
LWSTDA38260EX/D	0.038 in (0.97 mm)	260 cm (102 in)	Angled	Standard Exchange
LWSTDA3880/D	0.038 in (0.97 mm)	80 cm (31.5 in)	Angled	Standard

Catalog Number	Diameter	Length	Tip Shape	Configuration
LWSTDS18150/D	0.018 in (0.46 mm)	150 cm (59")	Straight	Standard
LWSTDS18180/D	0.018 in (0.46 mm)	180 cm (71 in)	Straight	Standard
LWSTDS18260EX/D	0.018 in (0.46 mm)	260 cm (102 in)	Straight	Standard Exchange
LWSTDS25150/D	0.025 in (0.64 mm)	150 cm (59 in)	Straight	Standard
LWSTDS25180/D	0.025 in (0.64 mm)	180 cm (71 in)	Straight	Standard
LWSTDS25260EX/D	0.025 in (0.64 mm)	260 cm (102 in)	Straight	Standard Exchange
LWSTDS35150/D	0.035 in (0.89 mm)	150 cm (59 in)	Straight	Standard
LWSTDS35180/D	0.035 in (0.89 mm)	180 cm (71 in)	Straight	Standard
LWSTDS35220/D	0.035 in (0.89 mm)	220 cm (87 in)	Straight	Standard
LWSTDS35260EX/D	0.035 in (0.89 mm)	260 cm (102 in)	Straight	Standard Exchange
LWSTDS3580/D	0.035 in (0.89 mm)	80 cm (31.5 in)	Straight	Standard
LWSTDS38150/D	0.038 in (0.97 mm)	150 cm (59 in)	Straight	Standard
LWSTDS38180/D	0.038 in (0.97 mm)	180 cm (71 in)	Straight	Standard
LWSTDS38260EX/D	0.038 in (0.97 mm)	260 cm (102 in)	Straight	Standard Exchange
LWSTFA35150/D	0.035 in (0.89 mm)	150 cm (59 in)	Angled	Stiff
LWSTFA35180/D	0.035 in (0.89 mm)	180 cm (71 in)	Angled	Stiff
LWSTFA35220/D	0.035 in (0.89 mm)	220 cm (87 in)	Angled	Stiff
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LWSTFS35180/D	0.035 in (0.89 mm)	180 cm (71 in)	Straight	Stiff
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LWSTFS38180/D	0.038 in (0.97 mm)	180 cm (71 in)	Straight	Stiff

2.4 Accessories

The Splashwire Hydrophilic Guide Wire does not include or require an “accessory for a medical device” as defined by the MDR. Additional devices that may be associated with conventional percutaneous vascular access include access needle, introducer, and dilator.

2.5 Devices Used in Combination

The Splashwire Hydrophilic Guide Wire is not intended to be used in combination with any other devices or products.

3.0 Risks and Warnings

3.1 Residual Risks and Undesirable Effects

The Merit Risk Management process is conducted in accordance with EN ISO 14971:2019. Risk assessment processes are utilized to analyse risks associated with the use of Merit devices, including possible misuses of a device. This ensures that all foreseeable potential failure modes and associated risks have been considered and addressed in the device design and/or production quality system. The process involves the following key aspects:

- Identifying potential failure modes, and their likely causes and effects
- Evaluating the probability of occurrence, degree of severity and relative detectability of each failure
- Identifying controls and preventive measures

All possible risk control measures have been implemented and verified and the Splashwire Hydrophilic Guide Wire has met all applicable regulations and standards. Through the clinical evaluation process, information relative to the clinical state-of-the-art and potential adverse events (AEs) are identified based on a review of the pertinent clinical evidence.

Intended clinical benefits: The Splashwire Hydrophilic Guide Wire has indirect clinical benefits for the patient since it assists other medical devices in achieving their intended purpose, without having a direct therapeutic or diagnostic function itself. It is used to gain vascular access and placement of compatible diagnostic or therapeutic medical devices that have a direct therapeutic or diagnostic function.

Articles published from January 1, 2017 to December 31, 2021 were reviewed. Based on the literature, guide wires have been successfully used for various diagnostic and interventional endovascular procedures to gain vascular access. Guide wires are beneficial in that they facilitate diagnostic and therapeutic interventional procedures. For the clinical evaluation, the performance outcome was defined as follows:

- Technical Success: Interventional procedure successfully performed using the Splashwire Hydrophilic Guide Wire or equivalent Laureate Guide Wire.

Technical success rates from the clinical literature and PMCF data are very high. Overall, technical success was 97.7% for the Splashwire or Laureate Guide Wire and 96.6% for the benchmark devices.

The potential complications/AEs related to the subject device as identified in the IFUs are summarized in Table 7. In addition, the device/procedure-related events identified in the literature, and the corresponding risk assessment harms are presented in Table 8.

Table 7. Splashwire Hydrophilic Guide Wire: Potential Complications

Configuration	Adverse Events/Hazards
Splashwire Hydrophilic Guide Wire	• Thrombus • Emboli • Arterial or venous vessel wall damage • Plaque dislodgment • Hematoma at the puncture site • Infection • Vessel perforation • Vessel spasm • Hemorrhage • Vascular thrombosis • Other potential access site complications leading to bleeding, dissection, or perforation that may require intervention.

Table 8. Adverse Events: Risk Assessment

Complications from the Literature	Device-Related	Procedure-Related	IFU Complications	Harms
Perforation requiring emergency laparotomy	X	-	• Arterial or venous vessel wall damage • Vessel perforation • Other potential access site complications leading to bleeding, dissection, or perforation that may require intervention	• Soft Tissue Injury (3)
Internal mammary artery injury	X	-	• Arterial or venous vessel wall damage • Vessel perforation • Other potential access site complications leading to bleeding, dissection, or	• Soft Tissue Injury (3)

Complications from the Literature	Device-Related	Procedure-Related	IFU Complications	Harms
			perforation that may require intervention	

The Splashwire Hydrophilic Guide Wire has been used with a high level of safety during interventional procedures in patients. Device-related adverse events reported in the clinical literature for the Splashwire or Laureate Guide Wire including their rate of incidence and time of occurrence are shown in Table 9. Both adverse events were from off-label uses of the Laureate Guide Wire and therefore were considered as part of the risk assessment for the device but not the critical analysis for safety. There were no device-related adverse events reported for the comparable benchmark guide wires.

Table 9. Adverse Events from Splashwire/Laureate Guide Wire Studies

Device-Related Adverse Event	Splashwire/Laureate Guide Wire Studies, n/N (%)	Timing of Adverse Event		
		Acute (≤ 30 days)	> 30 days	Not Reported
Equivalent Device, Off-Label Use in Coronary Interventions and Colon Strictures				
Perforation requiring emergency laparotomy	1/1(100%)	1	0	0
Internal mammary artery injury	1/1 (100%)	1	0	0

Safety data for the Splashwire and Laureate Guide Wire from the clinical literature and for comparable benchmark guide catheters are summarized in Table 10. The cumulative device-related AE rate for the Splashwire and Laureate Guide Wire is 0%. The overall cumulative device-related AE rate for the comparable benchmark microcatheters is 0% (0/356). Based on the comparative analysis, the UBL of the 1-sided 95% confidence interval for p1-p2 is less than 0.10 (10%). Therefore, H_0 is rejected and the AE rate for the subject device/equivalent comparator is established as non-inferior to the comparable benchmark guide wires at a 95% confidence level. Therefore, the subject device/equivalent comparator satisfies the established acceptance criteria for safety measures.

Table 10. Comparative Adverse Event Rates: Splashwire/Laureate Guide Wire

Attribute	Subject Device	Benchmark Devices	Estimated Difference [95% UBL]	UBL < 10%
Device-Related AE Rate	0% (0/132)	0% (0/356)	0% (0%)	PASS

In summary, the safety of the subject device has been substantiated via objective evidence from clinical literature data. The results of the clinical risk/safety analysis demonstrate that the subject devices meet the established acceptance criteria with respect to safety measures exhibit an acceptable overall safety profile. No new safety concerns specific to the subject device were identified in this evaluation, and the rates reported in the literature are consistent with available data for state-of-the-art alternative treatments

3.2 Warnings and Precautions

The warnings and precautions for the Splashwire Hydrophilic Guide Wire are listed in Table 11.

Table 11. Splashwire Hydrophilic Guide Wire: Warnings & Precautions

Category	Labeling Statements
Warnings	• Inspect wire for damage prior to use, do not use a wire that has been bent, kinked, or damaged. Use of a damaged wire may result in vessel damage or wire fragment release into the vessel. • Do not reshape the hydrophilic wire by any means. Attempting to reshape the wire may cause damage to the wire. • Do not manipulate or withdraw the wire through a metal entry needle or a metal dilator, or use this wire with devices which contain metal parts such as atherectomy catheters or laser catheters or metal torque devices. This may result in destruction and /or separation of the outer polyurethane coating requiring retrieval. A plastic entry needle is recommended when using this wire for initial placement, or a catheter, introducer sheath or vessel dilator should replace the needle as soon as the guide wire has been inserted into the vessel. • Never advance the guide wire against resistance without first determining the reason for the resistance under fluoroscopy. If resistance occurs and the cause of resistance cannot be determined, remove the guide wire and device as a unit. Excessive force against resistance may result in damage to the wire and/ or to the vessel. • When manipulating, advancing, exchanging, or withdrawing a catheter over the wire, secure and maintain the guide wire in place under fluoroscopy to avoid unexpected guide wire advancement; otherwise damage to the vessel wall by the wire's tip may occur. • The hydrophilic guide wire should be used only by a physician, who is well trained in manipulation and observation of guide wires under fluoroscopy. • In the EU any serious incident that has occurred in relation to the device should be reported to the manufacturer and competent authority of the applicable member states. •
Precautions	• When using a drug or a device concurrently with the wire, the operator should have a full understanding of the properties/characteristics of the drug or device so as to avoid damage to the hydrophilic guide wire. • Use care when manipulating this guide wire through a tightened Hemostasis valve
Reuse Precautions	• For single patient use only. Do not reuse, reprocess or resterilize. Reuse, reprocessing or resterilization may compromise the structural integrity of the device and/or lead to device failure which, in turn, may result in patient injury, illness or death. Reuse, reprocessing or resterilization may also create a risk of contamination of the device and/or cause patient infection or cross-infection, including, but not limited to, the

Category	Labeling Statements
	transmission of infectious disease(s) from one patient to another. Contamination of the device may lead to injury, illness or death of the patient.

The general cautions for the Splashwire Hydrophilic Guide Wire are as follows:

- The safety and effectiveness of the Splashwire Hydrophilic Guide Wire has not been established in the coronary or neurovasculature
- At least 5 cm of the wire should protrude from the device hub at all times to prevent the wire from sliding entirely into the device due to the low sliding friction of this wire.
- Contents of unopened, undamaged package are sterile and non-pyrogenic.
- Carefully read all warnings, precautions, and directions prior to use. Failure to do so may result in the improper use of this device which could cause the following complications:
    - Shearing of the hydrophilic guide wire
    - Release of plastic pieces or fragments from the hydrophilic guide wire which may need to be retrieved from the vasculature.
    - Vessel trauma

3.3 Other Relevant Safety Aspects

The Splashwire Hydrophilic Guide Wire has not been subject to any field safety corrective actions.

4.0 Summary of Clinical Evaluation and Postmarket Clinical Follow-up (PMCF)

4.1 Summary of Clinical Data for the Equivalent Device

To adequately support safety and performance with sufficient clinical data for the Splashwire Hydrophilic Guide Wire, equivalence was established between the two variations of the Hydrophilic Guide Wire coating: the Splashwire Hydrophilic Guide Wire (Basic UDI-DI: 0884450BUDI336PT) and the previous Laureate Guide Wire (Basic UDI-DI: N/A) studied in the literature. The Laureate Guide Wire is marketed globally and received Conformité Européenne (CE)-Mark in 2009. The device was cleared by the US FDA in 2017. It is also approved and marketed in Canada and Australia. The technology and intended use for the Laureate Guide Wire is well established and comparable to other similar devices. A summary of all available clinical data for the Laureate Guide Wire is provided in Section 4.3.

4.2 Summary of Clinical Investigations of the Subject Device

Conformity of the Splashwire Hydrophilic Guide Wire is pending assessment and endorsement by the applicable NB. No pre-market clinical investigations of the device were conducted in the EU prior to the initial CE marking. A summary of all available clinical data for the Splashwire Hydrophilic Guide Wire is provided in Section 4.3.

4.3 Summary of Clinical Data from Other Sources

Scientific Literature Review

A review of relevant clinical literature for the Splashwire and Laureate Guide Wire was conducted. Table 12 and Table 13 summarize the literature included for the evaluation of the safety and performance of the Splashwire Hydrophilic Guide Wire.

Table 12. Splashwire/Laureate Guide Wire: Summary Study Characteristics

Author (Year) LOE Study Type	Primary Clinical Indication	Device Application, Access	Patients/Devices	Devices Used	Gender (M/F) Age (years)	Follow-up
Laureate Guide Wire (Equivalent Comparator)						
Peripheral Vasculature (On-Label)						
Farghaly (2017)[1] LOE: B2 Retrospective, single-center study	HCC	The common femoral artery was punctured, and the Cobra catheter (5 Fr) was passed through a 5 Fr introducer guided by a 0.035 Fr diameter Laureate Guide Wire.	75/75	Laureate Guide Wire	59 M/16 F Mean age: 62.03 ± 9.15 and 60.18 ± 6.64	2 months
Forauer (2013)[2] LOE: C Case report	Arteriovenous fistulas	Venous side branch was accessed via micropuncture of the cephalic vein. A 0.035-inch angled Laureate Guide Wire and 4 Fr Berenstein catheter were manipulated to the peripheral portion of the fistula and then to the central region.	1/1	Laureate Guide Wire	1 M, 58	NR
Coronary Interventions and Colon Strictures (Off-Label)						
Najran (2017)[3] LOE: C Case report	Benign ischemic colorectal stricture	The biodegradable stent was inserted via fluoroscopic-guided insertion of a 150-cm Laureate Guide Wire through the stricture, with the help of a 65-cm KA2 catheter. The hydrophilic wire was then exchanged for a stiff 260-cm wire.	1/1	Laureate Guide Wire	1 M, 40	1 year

Author (Year) LOE Study Type	Primary Clinical Indication	Device Application, Access	Patients/Devices	Devices Used	Gender (M/F) Age (years)	Follow-up
Sarti (2021)[4] LOE: C Case report	Fractured peripherally inserted central catheter in right heart chamber and inferior vena cava (IVC)	Ultrasound-guided puncture was performed in the femoral vein and an introducer was then placed. A Laureate Guide Wire was placed through the introducer and brought up to the right atrium.	1/1	Laureate Guide Wire	1 F, 64	NS
Zeng (2018)[5] LOE: C Case report	Angina pectoris	The diagnostic catheter (6F TIG, TERUMO, Japan) was withdrawn, and the Laureate Guide Wire was advanced.	1/1	Laureate Guide Wire	1 M, 78	NR
Mixed Cohort (Laureate Guide Wire and Terumo Glidewire)						
Peripheral Vasculature (On-Label)						
Mortensen (2019)[6] LOE: B2 Prospective, observational study	Symptomatic leiomyomata with or without adenomyosis	TRA or TFA uterine artery embolization. Bentson wire into descending aorta with a 5 Fr angled catheter was exchanged for Terumo Glidewire or Laureate Guide Wire, which was used to cannulate UAs	66/66	Laureate Guide Wire or Terumo Glidewire	0 M/66 F TRA group mean age: 45.1 ± 4.9 TFA group mean age: 44.4 ± 4.9	NR

Abbreviations: cm = centimeter; F = female; F/Fr = French; HCC = hepatocellular carcinoma; IVC = inferior vena cava; LOE = level of evidence; M = male; NR = not reported; NS = not specified; TFA = transfemoral approach; TRA = transradial approach; UA = uterine artery

Table 13. Splashwire Hydrophilic Guide Wire: Safety and Performance Summary

Author (Year) LOE Study Type	Patients/Devices	Devices Used	Technical Success n/N (%)	Device-Related AE Rate, n/N (%)	Other Notes
Laureate Guide Wire (Equivalent Comparator)					
Peripheral Vasculature (On-Label)					
Farghaly (2017)[1] LOE: B2 Retrospective, single-center study	75/75	Laureate Guide Wire	75/75 (100.0%)	0/75 (0.0%)*	AEs: Major complications: Acute hepatic decompensation: 8/75 (10.7%) Liver cell failure: 8/75 (10.7%) Portal vein thrombosis: 1/75 (1.3%) Hepatic encephalopathy: 7/75 (9.3%) All-cause mortality: 0/75 (0.0%) Minor complications: Postablation syndrome: 30/75 (40.0%) Postembolization syndrome: 36/75 (48.0%) Skin infection: 3/75 (4.0%)
Forauer (2013)[2] LOE: C Case report	1/1	Laureate Guide Wire	1/1 (100.0%)	NR	
TOTALS	**76/76**		**76/76 (100.0%)**	**0/75 (0.0%)**	
Coronary Interventions and Colon Strictures (Off-Label)					
Najran (2017)[3] LOE: C Case report	1/1	Laureate Guide Wire	1/1 (100.0%)	1/1 (100.0%)	40-year-old male with stricture in the descending colon (no metastasis) AEs: Perforation requiring emergency laparotomy (discharged after 2 days): 1/1 (100.0%)
Sarti (2021)[4] LOE: C Case report	1/1	Laureate Guide Wire	1/1 (100.0%)	0/1 (0.0%)	64-year-old female with a fractured peripherally inserted central catheter device in the right cardiac chambers and pulmonary artery. The fractured device in the right atrium was retrieved and taken out. There were no additional fragments or foreign bodies on X-ray at follow-up.
Zeng (2018)[5] LOE: C Case report	1/1	Laureate Guide Wire	0/1 (0.0%)	1/1 (100.0%)	78-year-old male with multivessel coronary lesions; study authors noted that the device strayed unnoticed AEs: Internal mammary artery injury (vessel perforation): 1/1 (100.0%)
TOTALS	**3/3**		**2/3 (66.7%)**	**2/3 (66.7%)**	

Author (Year) LOE Study Type	Patients/Devices	Devices Used	Technical Success n/N (%)	Device-Related AE Rate, n/N (%)	Other Notes
Mixed Cohort (Laureate Guide Wire and Terumo Glidewire)					
Peripheral Vasculature					
Mortensen (2019)[6] LOE: B2 Prospective, observational study	66/66	Laureate Guidewire and Terumo Glidewire	TRA group: 27/27 (100.0%) TFA group: NR	NR	
TOTALS	**66/66**		**27/27 (100.0%)**		
OVERALL TOTALS**	**145/145†**		**105/106 (99.1%)†**	**2/78 (2.6%)**	

Abbreviations: AE = adverse event; LOE = level of evidence; NR = not reported; TFA = transfemoral approach; TRA = transradial approach

* This rate exceeds 100% because Farghaly 2017 reported total number of complications across the patient population, with some patients experiencing more than one complication

** This row includes all data (both pivotal and non-pivotal literature)

† Rate includes mixed cohort with both Laureate Guide Wire and Terumo Glidewire guide wire use

PMCF Data

The clinical evidence supporting the safety and performance of the Splashwire Hydrophilic Guide Wire includes post-market clinical follow-up (PMCF) data from 57 procedures in which the Splashwire Hydrophilic Guide Wire was used (see Table 14). The procedures were safe, and no unexpected medical problems happened that were related to the Splashwire Hydrophilic Guide Wire. In all performance measures, the Splashwire Hydrophilic Guide Wire performed as well as similar competitor devices.

Table 14. Splashwire Hydrophilic Guide Wire PMCF Report Results

Clinician Number	Procedures	Performance Successfully Reaching the Target Location n/N (%)	Performance Successfully Facilitate Placement of Devices During Procedures n/N (%)	Safety Adverse Event n/N (%)
1	4	4/4 (100)	4/4 (100)	0/4 (0)
2	1	1/1 (100)	1/1 (100)	0/1 (0)
3	2	2/2 (100)	2/2 (100)	0/2 (0)
4	1	1/1 (100)	1/1 (100)	0/1 (0)
5	4	4/4 (100)	4/4 (100)	0/4 (0)
6	1	1/1 (100)	1/1 (100)	0/1 (0)
7	1	1/1 (100)	1/1 (100)	0/1 (0)
8	1	1/1 (100)	1/1 (100)	0/1 (0)
9	1	1/1 (100)	1/1 (100)	0/1 (0)

Clinician Number	Procedures	Performance Successfully Reaching the Target Location n/N (%)	Performance Successfully Facilitate Placement of Devices During Procedures n/N (%)	Safety Adverse Event n/N (%)
10	1	1/1 (100)	1/1 (100)	0/1 (0)
11	2	0/2 (0)	1/2 (50)	0/2 (0)
12	4	4/4 (100)	4/4 (100)	0/4 (0)
13	1	1/1 (100)	1/1 (100)	0/1 (0)
14	1	1/1 (100)	1/1 (100)	0/1 (0)
15	1	1/1 (100)	1/1 (100)	0/1 (0)
16	1	0/1 (0)	0/1 (0)	0/1 (0)
17	2	2/2 (100)	2/2 (100)	0/2 (0)
18	1	1/1 (100)	1/1 (100)	0/1 (0)
19	1	0/1 (0)	0/1 (0)	0/1 (0)
20	2	2/2 (100)	2/2 (100)	0/2 (0)
21	1	1/1 (100)	1/1 (100)	0/1 (0)
22	3	3/3 (100)	3/3 (100)	0/3 (0)
23	1	1/1 (100)	1/1 (100)	0/1 (0)
24	4	4/4 (100)	4/4 (100)	0/4 (0)
25	2	2/2 (100)	2/2 (100)	0/2 (0)
26	1	1/1 (100)	1/1 (100)	0/1 (0)
27	5	5/5 (100)	5/5 (100)	0/5 (0)
28	1	1/1 (100)	1/1 (100)	0/1 (0)
29	2	2/2 (100)	2/2 (100)	0/2 (0)
30	1	1/1 (100)	1/1 (100)	0/1 (0)
31	2	2/2 (100)	2/2 (100)	0/2 (0)
32	1	1/1 (100)	1/1 (100)	0/1 (0)
Total	57	53/57 (93)	54/57 (94.7)	0/57 (0)

4.4 Overall Summary of Clinical Performance and Safety

Data to support the safety and performance of the Splashwire Hydrophilic Guide Wire have been analyzed and provide evidence to support all the safety and performance outcomes. Based on a review of the clinical data, the overall benefits to patients of using the device for its intended purpose outweigh the overall risks.

4.5 Postmarket Clinical Follow-up (PMCF)

The need to conduct PMCF activities is subject to annual review as part of the PMS process and also based on emerging data. All data are subject to a risk review from which a determination is made regarding the requirements for PMCF.

The plan for ongoing PMCF for the Splashwire Hydrophilic Guide Wire is detailed in PMCFP-QRMTI0016-002. PMCF activities planned for the device include screening of scientific literature and survey of health care professionals. A literature search will be performed by qualified individuals. An evaluation form will be circulated to health care professionals that use the Splashwire Hydrophilic Guide Wire to collect cases or data points. The PMCF data analysis will include consideration the following:

- Assessment of any safety or performance issues identified in the product feedback evaluation forms to determine what impact if any was contributed by the Splashwire Hydrophilic Guide Wire.
- As part of the annual update, safety and performance data collected from the PMCF activity and the clinical literature will be analyzed and compared to the safety and performance clinical literature data for the benchmark guide wires.
- Assessment if any safety or performance issues identified in the product feedback evaluation forms constitutes a previously unidentified residual risk.

5.0 Diagnostic or Therapeutic Alternatives

5.1 Review of medical condition

Atherosclerosis is a condition in which the body's arteries become clogged and narrowed by fatty plaques or atheroma. Hardening and narrowing of the arteries is potentially dangerous for two reasons:

- Restricted blood flow to an organ can cause damage and prevent it from functioning properly.
- If a plaque ruptures, it will cause a blood clot to develop at the site of the rupture. The blood clot can block the blood supply to an important organ, such as the heart, triggering a heart attack, or the brain, triggering a stroke.

Atherosclerosis is a major risk factor for many different conditions involving the flow of blood. Collectively, these conditions are known as CVD. Examples of CVD include:

- PAD/peripheral vascular disease (PVD): a condition in which blood supply to the legs is blocked, causing pain or claudication
- Coronary heart disease: a condition in which the main arteries that supply the heart (the coronary arteries) become clogged up with plaques
- Stroke: a very serious condition in which the blood supply to the brain is interrupted
- Heart attack: a very serious condition in which the blood supply to the heart is blocked

Risk factors that can dangerously accelerate the process of atherosclerosis include smoking, a high-fat diet, a lack of exercise, being overweight or obese, diabetes and high blood pressure (hypertension). If left untreated, the outlook for atherosclerosis is poor. Treatment for atherosclerosis aims to prevent the condition from worsening to the point at which it can trigger a serious cardiovascular event, such as a heart attack. In the US,

CVD is responsible for 1 in every 4 deaths. Globally, CVD is the leading cause of death and results in enormous societal burden.[7]

Atherosclerosis is the most common cause of PAD, which is strongly related to age and associated with cardio- and cerebrovascular comorbidities.[8] Within the population, 3-10% are affected by PAD, and 20% of all patients are 70 years of age and older.[9] The ratio of asymptomatic and symptomatic patients is 4:1.[10] Men are more often affected than women but only at younger ages.[11] A rising worldwide prevalence is expected due to prolonged life expectancy.[12] According to the Global Burden of Disease Study 2013, PAD was responsible for over 40,000 deaths in 2013, an increase of 155% from 1990.[13] As atherosclerosis is a systemic process, there exists a strong correlation with coronary artery disease.[14] Patients with PAD also have an increased risk for other cardiovascular events (e.g., a 4-fold risk of myocardial infarction or at least a two-fold increase of ischemic stroke).[15] According to the American College of Cardiology/American Heart Association (ACC/AHA) practice guidelines, patients with PAD fit clinically into one of four categories depending on their symptoms: asymptomatic, intermittent claudication (IC), acute limb ischemia, or chronic limb ischemia (CLI).[14] CLI is the most serious condition of PAD and indicates that blood flow to the limbs is severely restricted from atherosclerosis. Patients with CLI carry an increased risk of major amputation without revascularization.[16] Mortality rates in asymptomatic patients within five years are 19% increase and in symptomatic patients to up to 24%.[9] In contrast, the prognosis of patients with IC is determined by cardiac or cerebrovascular complications and only 2% of patients with IC have a major amputation within 10 years.[17]

Endovascular treatment of thoracic and abdominal aortic aneurysms (AAAs) have advanced over the past decade such that more complex juxtarenal, pararenal, suprarenal, and thoracolumbar pathologies can be effectively treated.[18-20] These include fenestrated endografts,[18,20] chimney and periscope grafts,[19] and branched endografts.[21] Branched endografts can be particular beneficial as a means to avoid ischemic complications associated with side-branch exclusion. Approximately 25% of AAA patients over 65 years of age have aneurysmal involvement of the common iliac arteries (CIAs) and 7% involve the internal iliac arteries (IIAs).[21] Exclusion of the IIA can result in buttock claudication, sexual dysfunction, and bowel ischemia in some patients.[21] Hydrophilic guide wires are commonly used in these complex procedures to achieve initial access, selective canalization of stenotic side-branch vessels, or graft fenestrations.[18,19,21] In addition, hydrophilic guide wires have been used in body floss techniques to achieve a through-and-through rail to support the positioning and delivery of more advanced endograft configurations (e.g., sandwiched periscope).[22]

Patients with PAD commonly present with chronic total occlusions (CTOs) that require more advanced endovascular techniques to reopen the affected vessel with percutaneous transluminal angioplasty (PTA) balloons and stents.[23] Akif Cakar et al. (2018) utilized hydrophilic guide wires as their primary means of attempting CTO crossing in subclavian artery CTOs.[24] They reported successful CTO crossing in 93.8% of their patients.[24] Calcification of these lesions can make treatment more challenging and results in technical failure rates as high as 25%.[25] Calcification not only frequently necessitates the use of a subintimal approach to bypass the lesion, but also make true lumen re-entry more challenging.[23,25] Cannavale et al. (2017) utilized a hydrophilic-coated crossing catheter supported by a hydrophilic guide wire to achieve subintimal crossing and true lumen re-entry.[23] In cases where catheter re-entry was not possible, the hydrophilic guide wire was

advanced into the vessel.[23] This approach was successful in achieving true lumen re-entry in 96.8% of cases.[23] Chen et al. (2019) reported on the use of 0.018-inch hydrophilic guide wires to access and cross below-the-elbow multifocal stenoses and CTOs in patients with critical hand ischemia.[26] They achieved technical success in 88% of the patients in the study.[26]

5.2 Treatment options and interventions

Key diagnostic methods used in patients with suspected PAD include the following:

- The Ankle Brachial Pressure Index (ABPI) – the systolic blood pressure in the upper arm is measured and then a similar measurement is taken at the ankle. Then the second result (ankle) is divided by the first result (arm). For patients with PAD, the reduced blood flow will result in a lower blood pressure at the ankle and an ABPI < 1.
- Ultrasound scan – a procedure in which sound waves are used to compile a picture of the arteries in the leg. This process can identify the precise location of narrowing or blockage in the arteries.
- Angiogram – a special dye known as a contrast agent is injected into the leg. The agent shows up clearly on a computerized tomography (CT) or magnetic resonance imaging (MRI) scan to identify areas of narrowing or blockage.

The management of PAD focuses on two main goals: improving quality of life by reducing symptoms and reducing vascular morbidity and mortality.[14] There are two main types of treatment used in the management of PAD that do not use an endovascular or invasive approach:

- Lifestyle changes – patients with less severe cases of PAD are encouraged to make lifestyle changes to improve symptoms and reduce the risk of developing more serious CVD. Lifestyle changes include smoking cessation and structured regular exercise.
- Medication – different medications can be used to treat the underlying causes of PAD while reducing the risk of other CVDs:
    - Statins – statins work by helping to reduce the production of low-density lipoprotein cholesterol by the liver.
    - Antihypertensives – antihypertensive drugs are used to treat high blood pressure. A widely used type of antihypertensive is an angiotensin-converting enzyme (ACE) inhibitor. ACE inhibitors block the actions of some of the hormones that help to regulate blood pressure. They help to reduce the amount of water in the blood and widen the arteries, resulting in decreased blood pressure.
    - Antiplatelets – one of the greatest potential dangers of atherosclerosis is the breaking of plaque deposits from the artery wall. Plaque breakoff can cause a blood clot to develop at or near the site of the broken plaque. If a blood clot develops inside an artery that supplies the heart with blood (a coronary artery) it can trigger a heart attack. Similarly, if a blood clot develops inside any of the blood vessels going to the brain, it can trigger a stroke. Antiplatelet medication is prescribed to reduce the risk of blood clots. This medication reduces the ability of platelets (tiny blood cells) to stick together, so if a plaque does break apart, there is a lower chance of a blood clot developing.

- Cilostazol – if leg pain is severe, cilostazol may be prescribed. Cilostazol reduces the ability of the blood to clot, while causing the arteries in the legs to expand, which should both help improve the blood supply to the legs. However, cilostazol can potentially cause a wide range of side effects; for this reason, it is only used to treat the most problematic cases of PAD.

If above treatments are ineffective, surgery may be utilized. There are two main types of surgery for PAD:

- Angioplasty – an angioplasty is carried out under a local anesthetic, which means the patient is awake during the operation, but the legs will be numbed by the anesthetic, so the patient does not feel any pain. The surgeon inserts a tiny hollow tube known as a catheter into one of the arteries in the groin. The catheter is then guided to the site of the blockage. On the tip of the catheter is a balloon. Once the catheter is in place, the balloon is inflated, which helps widen the vessel. Sometimes a hollow metal tube known as a stent may be left in place to help keep the artery open.
- Bypass graft – a bypass graft is performed under a general anesthetic, which means the patient will be asleep during surgery and will not experience any pain. During surgery, the surgeon will remove a small section of a healthy vein in the leg. The vein is then grafted (joined) onto the blocked vein so the blood supply can be rerouted, or bypassed, through the healthy vein. Sometimes a section of artificial tubing can be used as an alternative to a grafted vein.

Modern practice employs an ‘‘endovascular-first” strategy in patients requiring intervention. Open surgery is reserved for patients with debilitating and/or treatment-resistant IC and CLI. Surgical or endovascular aortoiliac reconstruction is the mainstay of invasive therapy for significant distal aortic and iliac disease. The decision between open or endovascular repair for any lesion is made based on patient co-morbidities, life-expectancy, urgency, and local operator expertise. Open repair is preferred for complex or multi-segment disease as patency rates are considered higher and avoids the risk of endoleaks whereas endovascular modalities carry lower periprocedural morbidity and mortality.[27]

The use of hydrophilic guide wires can facilitate interventions to treat peripheral lesions that require balloon angioplasty with or without stenting. Kim K.S. et al. (2019) reported on the treatment of portal vein stenosis following liver transplant in 31 patients.[28] The authors utilized an 0.018” nitinol guide wire to access the portal vein and then switched to an 0.035” hydrophilic guide wire to support balloon angioplasty with or without self-expanding stent deployment.[28] Thrombolysis and thrombectomy is a common treatment for dysfunctional arteriovenous fistulas (AVFs) and arteriovenous grafts, but access can be challenging. Kim J.H. et al. (2019) reported on the use of an internal jugular vein approach to access the graft or fistula for intervention in 38 patients, and a hydrophilic guide wire was used to achieve access to the target lesion.[29] In a total of 50 interventions, the authors achieved 90% technical success (< 30% residual stenosis) and 88% clinical success (at least 1 successful hemodialysis session) with this technique.[29] Other authors have described the use of hydrophilic guide wires to access challenging lesions in the mesenteric artery[30] or in support of hybrid procedures to create dialysis fistulas in patients with caval stenosis.[31]

As discussed by Patel et al. (2015), several literature papers also demonstrate the feasibility of the transradial approach (TRA) to address different peripheral vascular lesions.[32] TRA has long been used to address practically all coronary artery lesion subsets. It has shown significant benefits when compared with transfemoral approach (TFA), particularly a reduction in puncture-site related bleeding complications. In a randomized trial comparing

TRA and TFA in liver cancer embolization patients, Yamada et al. (2018) demonstrated that TRA was associated with significantly higher patient preference (P<0.001) and lower operator radiation exposure levels (P=0.01).[33]

Bhatia et al. (2017) and Yamada et al. (2018) compared the use of TFA to TRA and/or transulnar access for peripheral embolization procedures in the prostate artery and hepatic artery, respectively.[33,34] Due to the smaller vessel calibers and the tortuosity associated with accessing the target vessels, hydrophilic guide wires were used in the TRA/ transulnar access procedures whereas conventional (i.e., non-hydrophilic) were used in the TFA procedures.[33,34] Bhatia et al. (2017) reported a technical success rate of 93.8% and significantly shorter procedure times as compared to TFA (P<0.01).[34] Yamada et al. (2018) showed no difference in safety between the TFA and TRA groups (P=0.11) and a significant reduction in radiation exposure (P=0.01).[33] Leibundgut et al. (2018) also describe how transradial access for percutaneous coronary interventions (PCI) has become more frequent in recent years.[35] The latest ESC guidelines recommend the transradial access for the management of acute coronary syndromes (class I, level A).[36] Radial access is also associated with reduced incidence of acute kidney injury after PCI.[37]

TRA can be utilized effectively to address peripheral vascular lesions, including the internal carotid, vertebral, subclavian, innominate, renal, aorto-iliac, celiac, mesenteric, and superficial femoral arteries.[38] TRA has been shown to be an effective alternative for TFA to address most peripheral vascular lesion subsets. TRA is emerging as a useful tool for most peripheral vascular interventions, offering the advantages of very low local vascular and bleeding complications, higher patient and staff comfort, rapid turnover, and lower hospital costs.[39] However, certain limitations of TRA arise from the small diameters of radial arteries and the large distance from the radial arteries to the target vessels.[38] There are limitations on the available equipment that can reach certain peripheral arteries with the necessary support to traverse complex anatomies and occlusions.[38] The longer distance from the access site makes the delivery of devices more challenging. There continues to be a need for a larger variety of radial-specific hydrophilic sheaths, longer guide wires, and crossing catheters that can maintain their crossing capabilities.[38]

Other advances include new technologies such as the PowerWire Radiofrequency Guidewire (Baylis Medical, Quebec, Canada) which can be used for recanalization of long-segment occlusions. Horikawa and Quencer (2017) discuss this specialized guide wire, its atraumatic radio-frequency energy delivery tip, and the successful use of this device with low frequency of complications.[40] Although rare, complications of central venous interventions can be catastrophic. When performing angioplasty, venous rupture can occur. A brachiocephalic vein rupture typically results in mediastinal hematoma or hemothorax.

Saab et al. (2019) also describe the orbital atherectomy system, a novel form of atherectomy that uses orbital sanding and pulsatile forces, an effective method of treatment for peripheral atherosclerotic lesions with varying levels of occlusion.[41] Although the device only has a general indication from the FDA to treat atherosclerotic lesions, they are effective in treating all kinds of lesions, and can therefore mitigate effects of all severities of peripheral artery disease. This approach to endovascular therapy involves the use of differential sanding to preferentially ablate fibrous, fibrofatty and calcified lesions, while deflecting healthy intima away from the crown. The eccentrically mounted crown design allows the device to employ rhythmic pulsating forces

that penetrate the medial layer, and cause cracking in the lesions in order to facilitate easier balloon inflation and intravascular drug elution. The combination of vessel modification and lumen enlargement through sanding can effectively restore blood flow to the extremities, and can eliminate risk of critical limb ischemia, as well as subsequent amputation. Extensive lab testing and clinical trials have confirmed the high success rates and low major AEs associated with this form of treatment. The device is economically viable as well since its cost is offset by the lower frequency of adjunctive therapy sessions when compared to other devices. Considering the results outlined in this manuscript, the Diamondback 360° is an effective form of atherectomy therapy for peripheral artery disease. In-depth understanding of the operation preparation, procedure, and best imaging techniques can help to optimize outcomes.[42] Outdated methods of intervention including balloon angioplasty are much less effective for treating calcified lesions. These challenging vessels require much higher inflation pressure thus increasing the incidence of plaque rupture, embolization and dissection.[43] The orbital atherectomy system (OAS) is a novel device treating calcified lesions in both above-the-knee and BTK situations, using an eccentrically mounted crown to create an orbital sanding mechanism and ablate intimal calcium. The OAS (Cardiovascular Systems Inc., St. Paul, MN, USA) creates a pulsatile, pounding force through the rotation of an offset crown, which effectively cracks the medial calcification of the smooth muscles and enhances vessel compliance. The safety and efficacy of this intervention strategy has been explored in many past clinical studies.

6.0 Suggested profile and training for users

The Splashwire Hydrophilic Guide Wire should be used by physicians trained in diagnostic and interventional radiology, cardiology, nephrology, and vascular surgery procedures.

7.0 Applicable Harmonized Standards and Common Specifications

The following harmonized standards and guidance documents were applied or considered during the design and development of the Splashwire Hydrophilic Guide Wire (Table 15). All of these standards and guidelines have been applied in full.

Table 15. Applicable Standards

Document	Title
General Standards	
ISO 13485	Quality Systems – Medical Devices – Quality Management Systems. Requirements for Regulatory Purposes
EN ISO 14971	Medical Devices - Application of Risk Management to Medical Devices
EN ISO 20417	Terminology, Symbols and Information Provided with Medical Devices; Information Supplied by the Manufacturer with Medical Devices
ISO 15223	Medical Devices - Symbols to be used with medical device labels, labelling, and information to be supplied
EN 556	Sterilization of medical devices – Requirements for medical devices to be labelled “sterile”

Document	Title
ISO 11135 *For EO*	Sterilization of health care products -- Ethylene oxide -- Requirements for development, validation and routine control of a sterilization process for medical devices
AAMI TIR 28	Product Adoption and process equivalency for ethylene oxide sterilization
ISO 10993-1	Biological Evaluation of Medical Devices – Part 1: Evaluation and testing
ISO 10993-3	Biological Evaluation of Medical Devices – Part 3: Tests for genotoxicity, carcinogenicity and reproductive toxicity
ISO 10993-4	Biological Evaluation of Medical Devices – Part 4: Selection of Tests for Interactions with Blood
ISO 10993-5	Biological Evaluation of Medical Devices – Part 5: Tests for cytotoxicity: *In Vitro* methods
ISO 10993-7	Biological Evaluation of Medical Devices – Part 7: Ethylene Oxide sterilization residuals
ISO 10993-10	Biological Evaluation of Medical Devices – Part 10: Tests for Irritation and sensitization
ISO 10993-11	Biological Evaluation of Medical Devices – Part 11: Tests for system toxicity
ISO 10993-12	Biological Evaluation of Medical Devices – Part 12: Sample preparation and reference materials
ISO 11607-1	Packaging for Terminally Sterilized Medical Devices. Part 1: Requirements for materials, sterile barrier systems, and packaging systems.
ISO 11607-2	Packaging for Terminally Sterilized Medical Devices. Part 2: Validation requirements for forming, sealing and assembly processes
ASTM F 2096	Standard Test Method for Detecting Gross Leaks in Medical Packaging by Internal Pressurization (Bubble Test)
ASTM F 1929	Standard Test Method for Detecting Seal Leaks in porous Medical Packaging by Dye Penetration
ASTM F 88	Standard Test Method for Seal Strength of Flexible Barrier Materials.
ASTM D 4169	Standard Practice for Performance Testing of Shipping Containers and Systems
ASTM F1980	Standard Guide for Accelerated Aging of Sterile Barrier Systems for Medical Devices
ISO 14644-1	Classification Of Air Cleanliness, Clean rooms & Associated Controlled Environments. Part 1: Classification of air cleanliness
ISO 14644-2	Cleanrooms and Associated Controlled Environments – Part 2: Monitoring to Provide Evidence of Cleanroom Performance Related to Air Cleanliness by Particle Concentration
ISO 11737-1	Sterilization of Medical Devices – Microbiological Methods – Part 1: Determination of a Population of Microorganisms on Products
ANSI/AAMI ST72	Bacterial Endotoxins – Test Methods, Routine Monitoring, and Alternatives to Batch Testing
ISO 10993-18	Biological Evaluation of Medical Devices – Part 18: Chemical Characterization of Medical Device Materials within a Risk Management Process
ASTM F2475-20	Standard Guide for Biocompatibility of Medical Device Packaging Materials
ASTM F640-20	Standard Test Methods for Determining Radiopacity for Medical Use
IEC 62366-1	Medical devices – Application of usability engineering to medical devices

Document	Title
Product Specific Standards	
ISO 11070	Sterile Single-Use Intravascular Catheter Introducers
Guidance	FDA guidance: Coronary and Cerebrovascular Guide Wire Guidance January 1995.
Guidance	FDA guidance: Coronary, Peripheral, and Neurovascular Guide Wires - Performance Tests and Recommended Labeling – October 2019
Guidance	FDA guidance: Intravascular Catheters, Wires, and Delivery Systems with Lubricious Coatings - Labeling Considerations – October 2019
Common Specifications	
None	None
Applicable Directives	
Council Directive 93/42/EEC	Medical Device Directive of the European Union

Abbreviations: AAMI = Association for the Advancement of Medical Instrumentation; EO = ethylene oxide; ISO = International Standards Organization; USP = United States Pharmacopeia

8.0 References

1. Farghaly A, Moustafa E, Seif H, et al. Doxorubicin-eluting beads versus combined conventional transarterial chemoembolization and percutaneous alcohol injection in the treatment of large hepatocellular carcinoma. Original Article. *Journal of Current Medical Research and Practice*. May 1, 2017 2017;2(2):105-110. doi:10.4103/jcmrp.Jcmrp_2_17
2. Forauer AR. Access of dysfunctional arteriovenous fistulas via outflow vein side branches. *J Vasc Interv Radiol*. Dec 2013;24(12):1915-7. doi:10.1016/j.jvir.2013.06.020
3. Najran P, Mullan D, Laasch H-U. Biodegradable stent insertion for ischaemic colorectal strictures: Tiger country. *Gastrointestinal Intervention*. 07/31 2017;6:145-147. doi:10.18528/gii160011
4. Sarti G, Quassone P, Tarotto L, Tamburrini S, Arienzo F, Santini G. Recovery of a broken PICC migrated in cardiac chambersan endovascular approach. *Radiol Case Rep*. Apr 2021;16(4):874-878. doi:10.1016/j.radcr.2021.01.034
5. Zeng Z, Chen Y, Song Y, Lin F. Internal mammary artery injury during percutaneous coronary intervention: a case report. *BMC Cardiovasc Disord*. Dec 4 2018;18(1):222. doi:10.1186/s12872-018-0972-4
6. Mortensen C, Chung J, Liu D, et al. Prospective Study on Total Fluoroscopic Time in Patients Undergoing Uterine Artery Embolization: Comparing Transradial and Transfemoral Approaches. *Cardiovasc Intervent Radiol*. Mar 2019;42(3):441-447. doi:10.1007/s00270-018-2100-3
7. Benjamin EJ, Blaha MJ, Chiuve SE, et al. Heart Disease and Stroke Statistics-2017 Update: A Report From the American Heart Association. *Circulation*. Mar 7 2017;135(10):e146-e603. doi:10.1161/CIR.0000000000000485
8. Lawall H, Huppert P, Espinola-Klein C, Rumenapf G. The Diagnosis and Treatment of Peripheral Arterial Vascular Disease. *Dtsch Arztebl Int*. Oct 28 2016;113(43):729-736. doi:10.3238/arztebl.2016.729 10.3238/arztebl.2016.0729
9. Diehm C, Schuster A, Allenberg JR, et al. High prevalence of peripheral arterial disease and co-morbidity in 6880 primary care patients: cross-sectional study. *Atherosclerosis*. 2004;172(1):95-105. doi:10.1016/s0021-9150(03)00204-1
10. Alahdab F, Wang AT, Elraiyah TA, et al. A systematic review for the screening for peripheral arterial

disease in asymptomatic patients. *J Vasc Surg*. Mar 2015;61(3 Suppl):42S-53S. doi:10.1016/j.jvs.2014.12.008
11. Vouyouka AG, Egorova NN, Salloum A, et al. Lessons learned from the analysis of gender effect on risk factors and procedural outcomes of lower extremity arterial disease. *J Vasc Surg*. Nov 2010;52(5):1196-202. doi:10.1016/j.jvs.2010.05.106
12. Fowkes FGR, Rudan D, Rudan I, et al. Comparison of global estimates of prevalence and risk factors for peripheral artery disease in 2000 and 2010: a systematic review and analysis. *The Lancet*. 2013;382(9901):1329-1340. doi:10.1016/s0140-6736(13)61249-0
13. Vos T, Barber RM, Bell B, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*. 2015;386(9995):743-800. doi:10.1016/s0140-6736(15)60692-4
14. Conte SM, Vale PR. Peripheral Arterial Disease. *Heart Lung Circ*. Apr 2018;27(4):427-432. doi:10.1016/j.hlc.2017.10.014
15. Zheng L, Yu J, Li J, et al. Prevalence of and risk factors for peripheral arterial disease among Chinese hypertensive patients with and without known cardiovascular disease. *Acta Cardiol*. 2008;63(6):693-639.
16. Bradbury AW, Adam DJ, Bell J, et al. Bypass versus Angioplasty in Severe Ischaemia of the Leg (BASIL) trial: A description of the severity and extent of disease using the Bollinger angiogram scoring method and the TransAtlantic Inter-Society Consensus II classification. *J Vasc Surg*. May 2010;51(5 Suppl):32S-42S. doi:10.1016/j.jvs.2010.01.075
17. Norgren L, Hiatt WR, Dormandy JA, et al. Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II). *J Vasc Surg*. Jan 2007;45 Suppl S:S5-67. doi:10.1016/j.jvs.2006.12.037
18. Oikonomou K, Katsargyris A, Brinster CJ, Renner H, Ritter W, Verhoeven EL. Retrograde Target Vessel Catheterization as a Salvage Procedure in Fenestrated/Branched Endografting. *J Endovasc Ther*. Aug 2015;22(4):603-9. doi:10.1177/1526602815592205
19. Yammine H, Briggs CS, Stanley GA, Ballast JK, Arko Iii FR. Advanced Techniques for Treating Juxtarenal and Pararenal Abdominal Aortic Aneurysms: Chimneys, Periscopes, Sandwiches and Other Methods. *Tech Vasc Interv Radiol*. Sep 2018;21(3):165-174. doi:10.1053/j.tvir.2018.06.006
20. Bannazadeh M, Beckerman WE, Korayem AH, McKinsey JF. Two-year evaluation of fenestrated and parallel branch endografts for the treatment of juxtarenal, suprarenal, and thoracoabdominal aneurysms at a single institution. *J Vasc Surg*. Jan 2020;71(1):15-22. doi:10.1016/j.jvs.2019.03.058
21. Mylonas SN, Rumenapf G, Schelzig H, et al. A multicenter 12-month experience with a new iliac side-branched device for revascularization of hypogastric arteries. *J Vasc Surg*. Dec 2016;64(6):1652-1659 e1. doi:10.1016/j.jvs.2016.04.065
22. Hsu HL, Huang CM, Chen YY, Hsieh FC, Chen JS. The Sandwich Technique with Body Flossing Wire to Revascularize Left Subclavian Artery in Thoracic Endovascular Aortic Repair. *Ann Vasc Surg*. Feb 2017;39:152-159. doi:10.1016/j.avsg.2016.04.016
23. Cannavale A, Ali T, Shen CY, Kassimis G, Krokidis M. Recanalization of peripheral chronic total occlusions: 'no fancy devices, just a crossing catheter'. *Expert Rev Cardiovasc Ther*. Mar 2017;15(3):221-225. doi:10.1080/14779072.2017.1297229
24. Akif Cakar M, Tatli E, Tokatli A, Kilic H, Gunduz H, Akdemir R. Percutaneous endovascular therapy for symptomatic chronic total occlusion of the left subclavian artery. *Singapore Med J*. Oct 2018;59(10):534-538. doi:10.11622/smedj.2018023
25. Dias-Neto M, Matschuck M, Bausback Y, et al. Endovascular Treatment of Severely Calcified Femoropopliteal Lesions Using the "Pave-and-Crack" Technique: Technical Description and 12-Month Results. *J Endovasc Ther*. Jun 2018;25(3):334-342. doi:10.1177/1526602818763352

26. Chen JX, Levin LS, Mantell MP, Redmond JW, Clark TWI. Endovascular Therapy for Below-the-Elbow Arterial Disease: An Initial Single-Center Experience. *J Endovasc Ther*. Aug 2019;26(4):505-511. doi:10.1177/1526602819854167
27. Chen J, Stavropoulos SW. Management of Endoleaks. *Semin Intervent Radiol*. Sep 2015;32(3):259-64. doi:10.1055/s-0035-1556825
28. Kim KS, Kim JM, Lee JS, Choi GS, Cho JW, Lee SK. Stent insertion and balloon angioplasty for portal vein stenosis after liver transplantation: long-term follow-up results. *Diagn Interv Radiol*. May 2019;25(3):231-237. doi:10.5152/dir.2019.18155
29. Kim JH, Cho SB, Kim YH, Chung HH, Lee SH, Sung DJ. Transjugular percutaneous endovascular treatment of dysfunctional hemodialysis access. *J Vasc Access*. Sep 2019;20(5):488-494. doi:10.1177/1129729818815327
30. Mendes BC, Oderich GS, Tallarita T, et al. Superior mesenteric artery stenting using embolic protection device for treatment of acute or chronic mesenteric ischemia. *J Vasc Surg*. Oct 2018;68(4):1071-1078. doi:10.1016/j.jvs.2017.12.076
31. Szewczyk D, Bojakowski K, Kasprzak D, Kazmierczak S, Piasecki A, Andziak P. Creation of Arteriovenous Fistulas and Grafts Concomitantly with Endovascular Correction of Outflow Veins: A Hybrid Procedure. *Ann Vasc Surg*. Nov 2019;61:356-362. doi:10.1016/j.avsg.2019.04.047
32. Patel T, Shah S, Pancholy S, et al. Utility of transradial approach for peripheral vascular interventions. *Cath Lab Digest*. 2015;23(8)
33. Yamada R, Bracewell S, Bassaco B, et al. Transradial Versus Transfemoral Arterial Access in Liver Cancer Embolization: Randomized Trial to Assess Patient Satisfaction. *J Vasc Interv Radiol*. Jan 2018;29(1):38-43. doi:10.1016/j.jvir.2017.08.024
34. Bhatia S, Harward SH, Sinha VK, Narayanan G. Prostate Artery Embolization via Transradial or Transulnar versus Transfemoral Arterial Access: Technical Results. *J Vasc Interv Radiol*. Jun 2017;28(6):898-905. doi:10.1016/j.jvir.2017.02.029
35. Leibundgut G, Degen C, Riede F. Transcutaneous Puncture of an Undeflatable Coronary Angioplasty Balloon Catheter. *Case Rep Cardiol*. 2018;2018:6252809. doi:10.1155/2018/6252809
36. Roffi M, Patrono C, Collet J-P, et al. 2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. *European Heart Journal*. 2016;37(3):267-315. doi:10.1093/eurheartj/ehv320
37. Ando G, Cortese B, Russo F, et al. Acute Kidney Injury After Radial or Femoral Access for Invasive Acute Coronary Syndrome Management: AKI-MATRIX. *J Am Coll Cardiol*. May 11 2017;doi:10.1016/j.jacc.2017.02.070
38. Chowdhury M, Secemsky EA. Contemporary Use of Radial to Peripheral Access for Management of Peripheral Artery Disease. *Current Treatment Options in Cardiovascular Medicine*. 2021;23(2)doi:10.1007/s11936-020-00895-x
39. Wang Z, Xia J, Wang W, et al. Transradial versus transfemoral approach for cerebral angiography: A prospective comparison. *J Interv Med*. Feb 2019;2(1):31-34. doi:10.1016/j.jimed.2019.05.008
40. Horikawa M, Quencer KB. Central Venous Interventions. *Tech Vasc Interv Radiol*. Mar 2017;20(1):48-57. doi:10.1053/j.tvir.2016.11.006
41. Saab F, Martinsen BJ, Wrede D, Behrens A, Adams GL, Mustapha J. Orbital atherectomy for calcified femoropopliteal lesions: a current review. *J Cardiovasc Surg*. 2019;60(2):212-220.
42. Ford ES, Li C, Pearson WS, Zhao G, Mokdad AH. Trends in hypercholesterolemia, treatment and control among United States adults. *Int J Cardiol*. Apr 15 2010;140(2):226-35. doi:10.1016/j.ijcard.2008.11.033
43. Mustapha JA, Diaz-Sandoval LJ, Karenko B, Saab F. Atherectomy and critical limb ischemia: a treatment approach for severely calcified vessels. *Vasc Dis Mgt*. 2013;10(10):E198-E207.

9.0 Revision History

SSCP Revision	ECN Number	Date Issued DD/MM/YYYY	Change Description	SSCP Author	Revision Validated by the Notified Body
REV 001	ECN 159900	13/06/2022	Initial SSCP for the Splashwire Hydrophilic Guide Wire	Shelsea Stone	☐ Yes Validation language: English ☒ No
REV 002	ECN 168341	02/05/2023	Update to SSCP for the Splashwire Hydrophilic Guide Wire to address notified body requests	Shelsea Stone	☒ Yes Validation language: English ☐ No
REV 003	ECN188567	10/28/2024	Adding translations	Shelsea Stone	☐ Yes Validation language: English ☒ No