Summary of Safety and Effectiveness Data (SSED)

I. General Information

Device Generic Name: Endovascular Graft

Device Trade Name: GORE® VIABAHN® Endoprosthesis
GORE® VIABAHN® Endoprosthesis with Heparin Bioactive Surface

Device Procode: PFV

Applicant's Name and Address: W.L. Gore & Associates, Inc.
3250 West Kiltie Lane, P.O. Box 500
Flagstaff, AZ 86002

Date(s) of Panel Recommendation: None

Premarket Approval Application (PMA) Number: P130006

Date of FDA Notice of Approval: December 5, 2013

Priority review: Not applicable

II. Indications for Use

The GORE® VIABAHN® Endoprosthesis is indicated for the treatment of stenosis or thrombotic occlusion at the venous anastomosis of synthetic arteriovenous (AV) access grafts.

III. Contraindications

1) The GORE® VIABAHN® Endoprosthesis family is contraindicated for non-compliant lesions where full expansion of an angioplasty balloon catheter was not achieved during pre-dilatation, or where lesions cannot be dilated sufficiently to allow passage of the delivery system.

2) The GORE® VIABAHN® Endoprosthesis with Heparin Bioactive Surface is contraindicated for the use in patients with known hypersensitivity to heparin, including those patients who have had a previous incidence of Heparin-Induced Thrombocytopenia (HIT) type II.

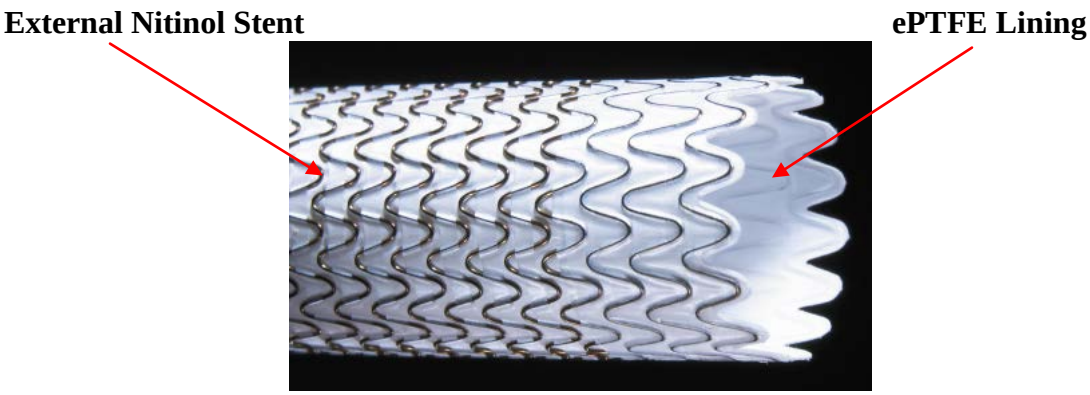
IV. Warnings and Precautions

See Warnings and Precautions in the labeling.

V. Device Description

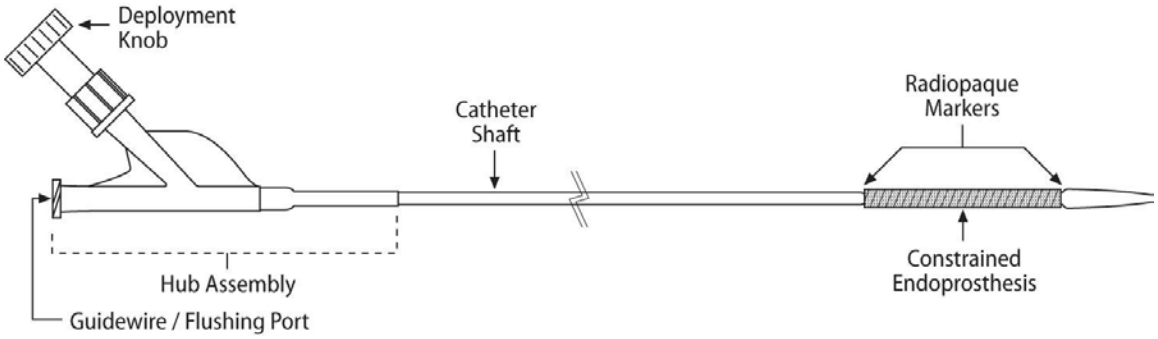
The GORE® VIABAHN® Endoprosthesis is a flexible, self-expanding endoluminal endoprosthesis consisting of an expanded polytetrafluoroethylene (ePTFE) lining with an external nitinol (NiTi=Nickel:Titanium) supporting structure extending along its entire length, as depicted in **Figure 1**. The luminal surface of the GORE® VIABAHN® Endoprosthesis with Heparin Bioactive is modified with a covalently bound, bioactive heparin technology referred to as the Carmeda BioActive Surface (CBAS®).

Figure 1: The GORE® VIABAHN® Endoprosthesis



The endoprosthesis is compressed and attached to a dual lumen delivery catheter, as shown in **Figure 2**. The larger central catheter lumen is utilized for flushing and introduction of a guidewire. The smaller lumen contains elements of the deployment mechanism. The delivery catheter hub assembly has one port for the deployment system and one port for flushing and guidewire insertion. To facilitate accurate endoprosthesis placement, two radiopaque markers are attached to the catheter shaft, marking the ends of the compressed endoprosthesis.

Figure 2: Delivery System for the GORE® VIABAHN® Endoprosthesis



Devices are sized in accordance with Table 1 below:

Table 1. Device Sizing

Device Sizing		Introducer Sheath Size (Fr) Guidewire Diameter 0.035" (0.889 mm)	Introducer Sheath Size (Fr) Guidewire Diameter 0.018" (0.460 mm)	Available device Lengths[2] (cm)	Recommended Balloon Diameter for Device Touch-up[3] (mm)
Labeled Device Diameter (mm)	Recommended Lumen Diameter[1] (mm)				
5	4.0 – 4.7	7	6	2.5, 5, 10, 15	5
6	4.8 – 5.5	7	6	2.5, 5, 10, 15	6
7	5.6 – 6.5	8	7	2.5, 5, 10, 15	7
8	6.6 – 7.5	8	7	2.5, 5, 10, 15	8
9	7.6 – 8.5	9	-	5, 10, 15	9
10	8.6 – 9.5	11	-	2.5, 5, 10, 15	10
11	9.6 – 10.5	11	-	2.5, 5, 10	12
13	10.6 – 12.0	12	-	2.5, 5, 10	14

[1]Recommended endoprosthesis compression within the vessel is approximately 5 – 20%.
[2]Labeled device lengths are nominal.
[3]For the 11 and 13 mm diameter devices, balloon inflation pressure should not exceed 8 atm.

Labeled Device Diameter (mm)	Labeled Endoprosthesis Lengths (cm)	Catheter Lengths (cm)		Guidewire Diameter (inch)
		75	120	
5, 6	2.5, 5, 10, 15	☑	☑	0.035
7, 8	2.5, 5, 10, 15	☑	☑	0.035
9	5, 10, 15	☑	☑	0.035
10	2.5, 5, 10, 15	☑	☑	0.035
11	2.5, 5, 10	☑	☑	0.035
13	2.5, 5, 10	☑	☑	0.035
5, 6	2.5, 5, 10, 15	n/a	☑	0.018 / 0.014
7, 8	2.5, 5, 10, 15	n/a	☑	0.018 / 0.014

VI. Alternative Practices or Procedures

Alternative procedures include use of medical management, creation of new fistulas/grafts, different methods for dialysis (peritoneal, catheter placement), other commercially available stent-grafts, percutaneous transluminal angioplasty (PTA), atherectomy, and bypass graft surgery. Each alternative has its own advantages and disadvantages. A patient should fully discuss these alternatives with his/her physician to select the method that best meets expectations and lifestyle.

VII. Marketing History

The GORE® VIABAHN® Endoprosthesis received pre-market approval from the FDA in June, 2005 for treatment of occlusive superficial femoral artery (SFA) and iliac artery disease (P040037 and its supplements), The GORE® VIABAHN® Endoprosthesis has been marketed outside of the United States for the endovascular

grafting of peripheral arteries for over 15 years, including in the following regions: Argentina; Australia; Austria; Barbados; Belgium; Bermuda; Bolivia; Brazil; Chile; China, Columbia; Costa Rica; Dominican Republic; Denmark; El Salvador; Finland; France; Germany; Greece; Guatemala; Hong Kong; Iceland; India; Indonesia; Ireland; Italy; Luxembourg; Malaysia; Mexico; Netherlands; New Zealand; Norway; Panama; Paraguay; Peru; Philippines; Portugal; Singapore; Spain; Sweden; Switzerland; Taiwan; Thailand; Trinidad/Tobago; United Kingdom; Uruguay; Venezuela; and Vietnam.

The device has not been withdrawn for any reason relating to the safety or effectiveness of the device.

VIII. Potential Adverse Effects of the Device on Health

Below is a list of the potential adverse effects (e.g., complications) associated with the use of the device for treatment of stenosis of the venous anastomosis of an AV access circuit:

- Aneurysm
- Arteriovenous (AV) fistula formation
- Bleeding/hemorrhage
- Cerebrovascular accident (CVA)
- Congestive heart failure
- Death
- Dissection/intimal injury
- Drug reactions to antiplatelet agents/contrast medium
- Edema in the arm or hand
- Hematoma
- Hypotension/hypertension
- Infection and/or pain at the access site
- Occlusion / restenosis of the treated vessel
- Pseudoaneurysm
- Puncture site complications
- Restenosis of stented segment requiring reintervention
- Steal syndrome
- Stent-graft embolization/migration
- Stent-graft fracture
- Stent-graft kinking
- Vessel perforation or rupture
- Vessel spasm

IX. Summary of Preclinical Studies

An original PMA for the GORE® VIABAHN® Endoprosthesis (P040037) was approved in August 2004 for the treatment of stenosis of the superficial femoral

artery. Approval of subsequent supplements expanded the indications for use to include treatment of stenosis of the iliac artery and permitted marketing of newer device designs and sizes. These supplements to P040037 included S002 that approved modifications to the endoprosthesis and delivery catheter design to reduce the overall delivery profile of the device by one french size; S003 that approved the addition of a 5 mm diameter endoprosthesis; S004 that approved the addition of a heparin coating on the GORE® VIABAHN® Endoprosthesis, referred to as the Heparin BioActive Surface; S013 that approved a modification of the design platform of the large diameter device (9-13 mm diameter); and S050 that approved the addition of a 25 cm length for the 5-8 mm diameter endoprostheses.

The SSED containing the non-clinical and clinical data to support the original indication is available on the CDRH website and is incorporated by reference here. The current PMA (P130006) was submitted to expand the indication for the GORE® VIABAHN® Endoprosthesis and the GORE® VIABAHN® Endoprosthesis with Heparin Bioactive Surface (hereafter referred to as the GORE® VIABAHN® Endoprosthesis) to include the treatment of stenosis or thrombotic occlusion at the venous anastomosis of synthetic arteriovenous (AV) access grafts. The non-clinical data reviewed under P040037 and its supplements were found adequate to support the new indication of treating the venous anastomosis of AV access grafts as part of PMA P130006.

X. Summary of Clinical Study for AV Access Revision

One primary clinical study was conducted to support the expanded indication for the revision of the venous anastomosis of arteriovenous access circuits with the GORE® VIABAHN® Endoprosthesis. Key characteristics of the clinical studies are provided in **Table 2** below:

Table 2: GORE® VIABAHN® Endoprosthesis versus Percutaneous Transluminal Angioplasty (PTA) to Revise Arteriovenous Grafts at the Venous Anastomosis in Hemodialysis Patients (REVISE) Pivotal Clinical Study Design

Clinical Study	Study Design	Objective	Number of Sites	Number of Subjects
AVR 06-01	Prospective, randomized, multi-center, controlled clinical trial with an additional non-randomized venous rupture group	To establish effectiveness and safety of the GORE VIABAHN® Endoprosthesis with PROPATEN Bioactive Surface when used to revise arteriovenous (AV) prosthetic grafts at the venous anastomosis in the maintenance or re-establishment of vascular access for hemodialysis	31 clinical sites enrolled the final cohort of the Intent-To-Treat (ITT) subjects	293 enrolled subjects comprised the ITT analysis group 145 subjects randomized to the GORE® VIABAHN® Device group 148 subjects randomized to the PTA group 4 patients enrolled as non-randomized subjects to the venous rupture group

A. Study Design

The AVR 06-01 study (IDE G070069) was a prospective, randomized, multicenter, controlled clinical trial. The objective of the study was to establish effectiveness and safety of the GORE® VIABAHN® Endoprosthesis with PROPATEN Bioactive Surface when used to revise arteriovenous (AV) prosthetic grafts at the venous anastomosis in the maintenance or re-establishment of vascular access for hemodialysis.

The study was approved to enroll 280 randomized subjects at 31 clinical sites. However, due to a Data and Safety Monitoring Board (DSMB) recommendation to exclude subject data from the effectiveness analysis for enrolled subjects that were ineligible for participation (e.g., protocol deviations at enrollment: clinical and/or angiographic inclusion/exclusion not met) and the potential for those data to bias the analysis, Gore replaced 15 subjects. Two hundred ninety-five (295) patients were enrolled, randomized, and treated in the AVR 06-01 study. One subject was excluded from all study analyses upon recommendation from the study's Medical Director and DSMB due to iatrogenic procedural complications. A second subject was excluded upon recommendation from the sponsor's legal team for an institutional site's failure to collect the Health Insurance Portability and Accountability Act (HIPAA) Authorization. Therefore, 293 subjects comprise the Intent–To–Treat (ITT) analysis group; four subjects were enrolled as non-randomized subjects into the "Rupture" arm

of the study. Subjects were enrolled between September 8, 2008 and May 17, 2011.

Sample size calculations for the study were based on the primary effectiveness endpoint, time-to-event of loss of target lesion primary patency, using an alpha of 0.025 and a beta of 0.20.

Of the 293 subjects in the ITT cohort, one hundred forty-five (145) subjects were randomized to the GORE® VIABAHN® Endoprosthesis group (test group) and 148 subjects were randomized to receive percutaneous transluminal angioplasty (PTA; control group). Four patients were enrolled as study subjects in the non-randomized "Rupture" arm of the study. Study subjects were followed for effectiveness and safety to withdrawal or study completion at 24 months. Data presented are based on all known information and include a minimum of 6-month follow-up on all study subjects.

An independent Data and Safety Monitoring Board (DSMB) was established in order to review safety data during the accrual phase of the study, and on an ongoing basis as needed. The DSMB was comprised of an interdisciplinary team that represented the disciplines of interventional radiology, interventional nephrology, transplant surgery, and biostatistics. This team was not directly involved in the conduct of the study. Recommendations could have included modifying the study, stopping the study, or continuing the study without modification. No Clinical Events Committee or core-imaging laboratory was used for this study.

1. Clinical Inclusion and Exclusion Criteria

   Enrollment in the REVISE study was limited to patients that were receiving hemodialysis treatment via a prosthetic graft located in the upper extremity and presented with clinical or hemodynamic evidence of graft thrombosis or graft dysfunction, and who fulfilled the criteria listed in **Tables 3a-b**.

Table 3a: REVISE Study Inclusion/Exclusion Criteria (Clinical)

Inclusion	Exclusion
1. Hemodialysis patient with a dysfunctional or thrombosed forearm or upper arm prosthetic vascular access graft. 2. The patient is ≥ 18 years of age. 3. The patient has a reasonable expectation of remaining on hemodialysis for 24 months. 4. The patient or his / her legal guardian understands the study and is willing and able to comply with follow-up requirements. 5. The patient or his / her legal guardian is willing to provide informed consent.	1. The age of the hemodialysis access graft is ≤ 30 days old from the date of the study procedure. 2. The patient has undergone an intervention (surgical or percutaneous) of the vascular access circuit ≤ 30 days from the date of the study procedure. 3. The patient has a native arteriovenous fistula currently used for hemodialysis. 4. The patient has an existing stent or stent graft anywhere within the current vascular access circuit. 5. The patient has an existing hemodialysis graft that has not been used successfully for hemodialysis. 6. The patient's hemodialysis graft is located in the thigh. 7. The patient has a compound or hybrid vascular

Table 3a: REVISE Study Inclusion/Exclusion Criteria (Clinical)

Inclusion	Exclusion
	access (i.e. graft-fistula hybrid). 8. The patient has steal syndrome related to the current vascular access sufficient to warrant a surgical intervention to treat hand ischemia. 9. The patient has a known or suspected systemic infection.[1,2] 10. The patient has a known or suspected infection of the hemodialysis graft. 11. The patient is currently taking maintenance immunosuppressant medication such as rapamycin, mycophenolate or mycophenolic acid, prednisone >10 mg daily dose, cyclosporine, tacrolimus, or cyclophosphamide.[3, 4, 5] 12. The patient has known bleeding disorder (e.g., hemophilia or von Willebrand's disease). 13. The patient has a defined hypercoagulable disorder.[6] 14. The patient has known sensitivity to heparin. 15. The patient is scheduled for a live donor kidney transplant. 16. The patient is enrolled in another investigational study. 17. The patient has comorbid conditions that may limit their ability to comply with the follow-up requirements. 18. Life expectancy is $\leq$ 24 months. 19. The patient has an untreatable allergy to radiographic contrast material. 20. The patient is pregnant. 21. In the opinion of the operating physician, the patient's hemodialysis graft is unsuitable for endovascular treatment.

[1] Patients colonized (not infected) with Methicillin-resistant *Staphylococcus aureus* (MRSA) could be enrolled unless treated with antibiotics other than topical agents. Patients colonized (not infected) with Vancomycin-resistant Enterococci (VRE) could be enrolled unless being treated with antibiotics.

[2] The study's Data Safety Monitoring Board determined that patients with exit-site catheter infections with only redness and no purulent drainage were acceptable for enrollment with the recommendation for prophylaxis against procedure-related infection and general treatment for simple exit site infection. Patients with purulent exit-site infections were excluded.

[3] Prednisone, used prophylactically during angiography for the prevention of a reaction to contrast agents, was permitted.

[4] Steroid inhalers were not an exclusion as they do not result in systemic immunosuppression.

[5] Presence of a coronary drug eluting stent was not an exclusion.

[6] Examples of defined hypercoagulable disorders included, but were not limited to Factor V Leiden mutation, Prothrombin III mutation G20210A, Antithrombin III deficiency, Protein C deficiency, Protein S deficiency, Antiphospholipid antibodies, and Activated Protein C Resistance.

Table 3b: REVISE Study Inclusion/Exclusion Criteria

Inclusion	Exclusion
1. The target lesion starts ≤ 30 mm from the venous anastomosis. 2. The target lesion has > 50% stenosis as measured per protocol. 3. The patient has no secondary stenosis or has a maximum of one secondary stenosis if the following criteria are satisfied: a. The secondary stenosis must be located in the graft or a peripheral vein. b. The secondary stenosis must be ≤ 50 mm in length. c. The secondary stenosis must be located ≥ 30 mm away from the edge of the target lesion. d. The secondary lesion causes > 50% stenosis. e. The secondary lesion is treated before randomization, using a conventional angioplasty balloon. f. Treatment of the secondary lesion with conventional angioplasty is successful with < 30% residual stenosis and no complications.	1. The secondary lesion is an occlusion. 2. The patient has central venous stenosis requiring treatment. 3. The physician is unable to fully inflate a conventional PTA balloon at the target lesion (i.e., focal waist remains in balloon upon inflation). 4. There is an angioplasty induced rupture that is unresponsive to balloon tamponade. 5. Diameter of prosthetic graft adjacent to target lesion is < 4.8 mm. [1] 6. The target lesion is entirely within the prosthetic graft. 7. The target lesion is in such a location that the GORE® VIABAHN® Device, once deployed, would be positioned within the zone of cannulation in the prosthetic graft.

2. Pre-Treatment and Follow-Up Schedule

The pre-treatment evaluation of patients included a review of the medical and vascular access history as well as a physical exam.

A block randomization scheme by site was employed to ensure that each clinical site enrolled approximately the same number of subjects in each treatment arm. Subjects were randomly assigned equally (1:1) to either the GORE® VIABAHN® Endoprosthesis group or the PTA group. Blocks were six subjects in size. Randomization was on a per-subject basis.

Subjects with an angioplasty-induced rupture unresponsive to balloon tamponade were eligible, based on the discretion of the site Investigator, for treatment with the VIABAHN device as non-randomized subjects as long as all other eligibility criteria were met ("Rupture Arm"). All pre- and post-procedural measurements of the vascular access and other procedure-related data were collected. Pre- and post-procedural imaging was required to document the severity of vein rupture and to measure required anatomical characteristics. All elements of the AVR 06-01 protocol were applied, including all follow-up requirements and adverse event reporting.

The goal of study follow-up was to track the natural course of the vascular access as the subject undergoes regular hemodialysis at their respective dialysis center. As such, there were no protocol requirements for additional

[1] Per the Instructions for Use, the recommended minimum vessel size for the use of a 6 mm device is 4.8 mm; therefore, subjects with a graft diameter adjacent to the target lesion < 4.8 mm were excluded from the study.

follow-up visits, imaging such as angiography at pre-specified intervals, or the collection of hemodialysis-specific clinical parameters. Site investigators and dialysis centers followed their institutional procedures for hemodialysis access surveillance.

At minimum, the Clinical Study Coordinator contacted the dialysis center at 1, 3, 6, 12, 18, and 24 - months post procedure to ascertain:

- date of last dialysis;
- if applicable, information regarding repeat intervention(s) including graft abandonment; and
- if applicable, adverse event or withdrawal information.

Subjects with dysfunctional or thrombosed grafts were referred for appropriate evaluation and treatment.

Type of repeat intervention to maintain or re-establish circuit patency was based on the best clinical judgment of physician (or per institutional standard of care). It was recommended to revise with investigational VIABAHN® devices for both test and control groups if necessary. The location of reintervention within the vascular access circuit was documented.

3. Clinical endpoints

Study endpoints and additional assessments were derived from the Society of Interventional Radiology's reporting standards for percutaneous interventions in dialysis access[1,2,3]. These endpoints were assessed over a 24-month follow-up period at intervals of 1, 3, 6, 12, 18, and 24 months.

The primary effectiveness endpoint of the study was target lesion primary patency, defined as the time interval of uninterrupted patency from initial study treatment to the next access thrombosis or intervention performed on the target lesion.

The primary safety hypothesis for the AVR 06-01 study was to demonstrate that the proportion of subjects remaining free from major device-, procedure-, and treatment site-related adverse events through 30 days post-procedure in the GORE® VIABAHN® Endoprosthesis group was not inferior to that of the PTA group. The p-value was computed using a one-sided non-inferiority test of proportions. If the p-value was less than or equal to 0.05, the proportion of subjects remaining free from major device**-**, procedure**-**, and treatment site-

[1] Haskal Z. 2005 International Symposium of Endovascular Therapy, Miami, FL.
[2] Borzatta, MA, Belville, J., Covered Stent Use in Vascular Access Rescue. 2004 Vascular Access for Hemodialysis IX.
[3] Aruny JE, Lewis CA, Cardella JF, *et al*; Society of Interventional Radiology Standards of Practice Committee. Quality improvement guidelines for percutaneous management of the thrombosed or dysfunctional dialysis access. *Journal of Vascular & Interventional Radiology* 2003;14(9)Part 2:S247-S253.

related adverse events through 30 days post-procedure in the GORE® VIABAHN® Device group demonstrated non-inferiority to the PTA group. For the non-inferiority analysis for safety, a delta of 15% was chosen as the smallest difference in the proportion of subjects experiencing major device-, procedure-, and treatment site-related adverse events that would be clinically relevant.

The primary analytical technique for follow-up endpoints and assessments was the time-to-event analysis, which employs methodologies such as Kaplan-Meier estimation, log-rank tests, and mean cumulative functions. Time-to-event analysis allowed for both: (a) omnibus assessment of difference across time; and (b) effective incorporation of information from censored subjects.

The study would be considered a success only if both the primary effectiveness and primary safety endpoints were met. One formal statistical analysis was planned in support of the PMA application, which was performed once all subjects (a) had either completed six months of follow-up or (b) had been withdrawn from the study. All subjects underwent post-market follow-up until they (a) either completed 24 months of follow-up or (b) withdrew from the study.

The study incorporated the following secondary endpoints. No statistical hypotheses were pre-specified for any of these endpoints:

- Anatomic Success: < 30% residual stenosis following study treatment.
- Clinical Success: The resumption of normal dialysis for at least one session.
- Procedural Success: Composite of anatomic and clinical success endpoints.
- Circuit Primary Patency: The time interval from initial study treatment to the next access thrombosis or intervention performed within the vascular access circuit.
- Assisted Primary Patency: The time interval from initial study treatment to occlusion (thrombosis) of the vascular access circuit.
- Access Secondary Patency: The time interval from initial study treatment to abandonment of the vascular access circuit.
- Treatment Site Secondary Patency: The time interval from initial study treatment to the elimination of the target lesion from the vascular access circuit.
- Freedom from adverse events

B. Accountability of PMA Cohort

The 293 patients enrolled, randomized, and treated in the REVISE study comprised the Intent-to-Treat (ITT) analysis group. All demographics, physical characteristics, medical and vascular histories, and safety analyses were

conducted using this ITT cohort. Two hundred sixty-nine (269) subjects comprised the Effectiveness Evaluable analysis group. Based on DSMB recommendations, twenty-four subjects were removed from effectiveness analysis due to protocol deviations. **Figure 3** and **Table 4** describe the number of subjects available in the ITT cohort at each follow-up interval. **Table 5** describes the number of patients withdrawn and the reasons for withdrawal with a statistical comparison between treatment groups.

If angioplasty of the target lesion caused venous rupture that was uncontrolled by balloon tamponade, the patient was ineligible for randomization into the study. However, in such a situation, the patient was eligible for enrollment as a non-randomized GORE® VIABAHN® Endoprosthesis subject as long as all other eligibility criteria were met. Four subjects enrolled in the non-randomized rupture arm but were not included as part of the ITT or effectiveness populations. However, one of these subjects was a screen failure. Three (3) subjects remain in the non-randomized cohort for analysis.

Figure 3. Subject Accountability

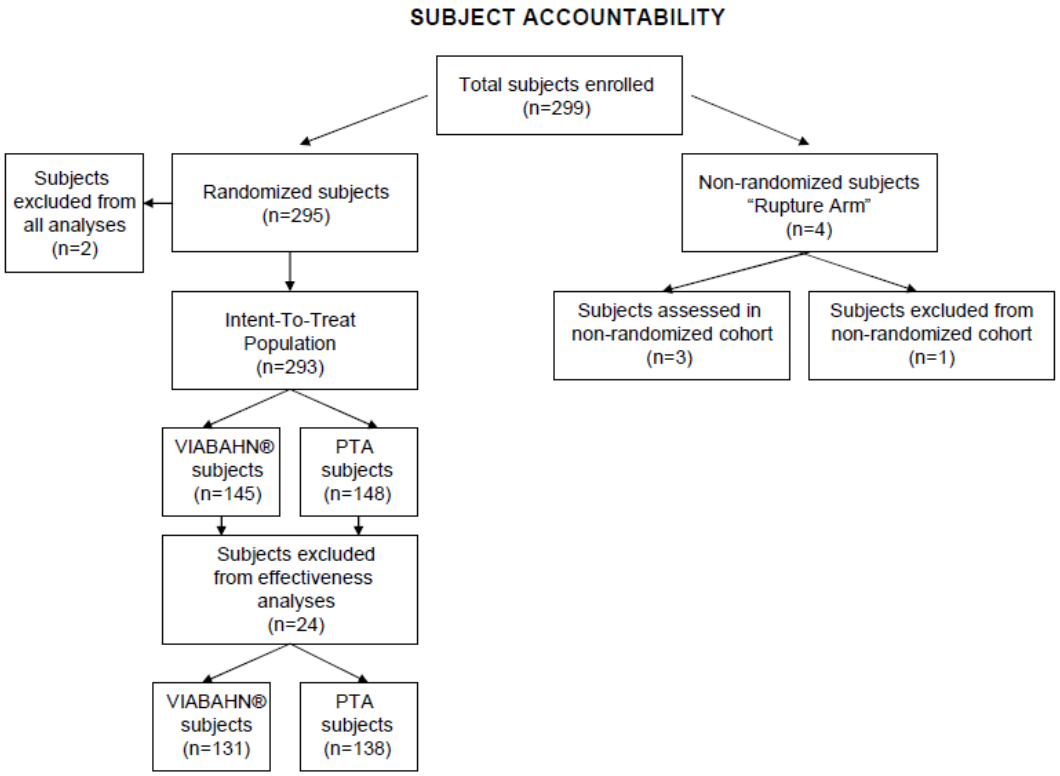


Table 4. Subject Availability

	VIABAHN Treatment Group	PTA Treatment Group	Overall
Intent-to-Treat Population	**145**	**148**	**293**

	VIABAHN Treatment Group	PTA Treatment Group	Overall
Subjects Available for Analysis at Month 1	136 (93.8%)	138 (93.2%)	274 (93.5%)
Subjects Available for Analysis at Month 3	127 (87.6%)	122 (82.4%)	249 (85.0%)
Subjects Available for Analysis at Month 6	107 (73.8%)	111 (75.0%)	218 (74.4%)
Subjects Available for Analysis at Month 12	90 (62.1%)	89 (60.1%)	179 (61.1%)
Subjects Available for Analysis at Month 18	81 (55.9%)	75 (50.7%)	156 (53.2%)
Subjects Completed 24 Months	65 (44.8%)	65 (43.9%)	130 (44.4%)

Numbers indicate subjects available for analysis by end of corresponding protocol window.
Percentages cited are the percentage of subjects available for analysis at each timepoint from the intent-to-treat population.

Table 5. Subject Disposition / Reasons for Withdrawal

	VIABAHN Treatment Group	PTA Treatment Group	Overall	p-value
Intent-to-Treat Population	**145**	**148**	**293**	
Subjects Completed 24 Months	65 (44.8%)	65 (43.9%)	130 (44.4%)	
Subjects Ongoing in Study	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Subjects Withdrawn Prior to 24 Months	80 (55.2%)	83 (56.1%)	163 (55.6%)	0.907 [1]
Subject Choice	1 (0.7%)	2 (1.4%)	3 (1.0%)	1.000 [1]
Investigator Choice	0 (0.0%)	2 (1.4%)	2 (0.7%)	0.498 [1]
Lost-to-Follow-up	1 (0.7%)	0 (0.0%)	1 (0.3%)	0.495 [1]
Graft Abandonment	48 (33.1%)	56 (37.8%)	104 (35.5%)	0.464 [1]
Death	23 (15.9%)	22 (14.9%)	45 (15.4%)	0.872 [1]
Other	7 (4.8%)	1 (0.7%)	8 (2.7%)	0.035 [1]

Percentages cited are the percentage of subjects from the intent-to-treat population.
[1] p-value assesses treatment differences using a two-tailed Fisher's exact test.

C. Study Population Demographics and Baseline Parameters

Baseline assessments of the REVISE study subjects include demographics, medical history, and vascular access history as described in **Table 6** and **Table 7**. Overall, the majority of subjects enrolled were Black or African American at 52.7% (154/292) followed by White or Caucasian at 40.1% (117/292). The only statistically significant difference between treatment groups for baseline assessments was in relation to Hispanic or Latino ethnicity (p=0.036). However, Hispanic or Latino ethnicity was not predominant in either of the treatment groups. Most subjects enrolled in AVR 06-01 presented with diabetes, hypertension, or both, with the exception of only one subject. There were no significant differences between treatment groups in relation to a medical history of diabetes or hypertension as well as hemodialysis access history. The subjects have been on dialysis for 3.85 ± 4.05 yrs using their current access for 2.11 ± 2.31 yrs with 1.83 ± 2.27 prior interventions at the treatment site.

Table 6. Baseline Characteristics

	VIABAHN Treatment Group	PTA Treatment Group	Overall	p-value
Intent-to-Treat Population	**145**	**148**	**293**	
Age (Yrs.)				
N (Data Available)	145	148	293	
Mean	62.2 ± 12.9	61.3 ± 15.0	61.7 ± 14.0	0.545 [1]
Ethnicity:				
N (Data Available)	142	144	286	
Hispanic or Latino	16 (11.3%)	30 (20.8%)	46 (16.1%)	0.036 [2]
Race				
N (Data Available)	145	147	292	
American Indian or Alaskan Native	0 (0.0%)	1 (0.7%)	1 (0.3%)	1.000 [2]
Asian	9 (6.2%)	7 (4.8%)	16 (5.5%)	0.617 [2]
Black or African American	74 (51.0%)	80 (54.4%)	154 (52.7%)	0.639 [2]
Native Hawaiian or Pacific Islander	1 (0.7%)	0 (0.0%)	1 (0.3%)	0.497 [2]
White or Caucasian	61 (42.1%)	56 (38.1%)	117 (40.1%)	0.551 [2]
Other	0 (0.0%)	4 (2.7%)	4 (1.4%)	0.122 [2]
Gender:				
N (Data Available)	145	148	293	
Female	76 (52.4%)	75 (50.7%)	151 (51.5%)	0.815 [2]
Physical Characteristics				
N (Data Available)	145	148	293	
Height (cm)	167.4 ± 12.2	165.4 ± 12.7	166.4 ± 12.4	0.168[1]
Weight (kg)	83.7 ± 29.3	81.2 ± 26.2	82.5 ± 27.7	0.511[1]
BMI	29.7 ± 9.1	29.5 ± 8.6	29.6 ± 8.8	0.891[1]

Percentages cited are the percentage of subjects out of the data available.
Means include ± Standard Deviation
Subjects may select multiple races.
[1] p-value assesses treatment differences using a two-tailed Wilcoxon rank-sum test.
[2] p-value assesses treatment differences using a two-tailed Fisher's exact test.

Table 7. Medical and Vascular Access History

	VIABAHN Treatment Group	PTA Treatment Group	Overall	p-value
Intent-to-Treat Population	**145**	**148**	**293**	
Medical History				
N (Data Available)	145	148	293	
History of Diabetes	94 (64.8%)	98 (66.2%)	192 (65.5%)	0.807 [1]
History of Hypertension	143 (98.6%)	144 (97.3%)	287 (98.0%)	0.684 [1]
Duration of Time Since Starting Hemodialysis (Yrs.)	3.64 ± 3.93	4.06 ± 4.16	3.85 ± 4.05	0.342 [2]
Vascular Access History				
Age of Vascular Access Graft (Yrs.)				
N (Data Available)	144	147	291	
Mean	1.93 ± 1.92	2.28 ± 2.64	2.11 ± 2.31	0.624 [2]
Total Number of Prior Interventions at the Target Lesion				
N (Data Available)	144	145	289	
Mean	1.85 ± 2.20	1.81 ± 2.34	1.83 ± 2.27	0.562 [2]
Total Number of Prior Interventions to the Current Prosthetic Graft or Circuit				
N (Data Available)	144	145	289	
Mean	2.28 ± 2.75	2.26 ± 2.90	2.27 ± 2.82	0.676 [2]

Percentages cited are the percentage of subjects out of the data available.
Means include ± Standard Deviation
[1] p-value assesses treatment differences using a two-tailed Fisher's exact test.
[2] p-value assesses treatment differences using a two-tailed Wilcoxon rank-sum test.

Treatment Details

There were no differences between treatment groups with relation to treatment details. Data presented here represent the overall ITT population not stratified by treatment group.

Table 8 describes the indication for the procedure at enrollment. Subjects could present with multiple indications for the procedure. The majority of subjects presented with graft thrombosis at 44.0% (129/293) followed by low blood flow at 29.4% (86/293). There were no differences between treatment groups in relation to indication for procedure.

Table 9 describes the target lesion characteristics. On average, the percent stenosis of the target lesion was 73.4 ± 13.2. The distance from the venous

anastomosis to the proximal edge of the target lesion was 3.56 ± 6.41 mm and the length of the target lesion was 23.44 ± 21.45 mm.

Table 10 describes the secondary lesion characteristics. Secondary lesions were present in 22.5% (66/293) of the subjects. A majority of the secondary lesions were located intragraft (75.8%; 50/66). On average, the percent stenosis of the secondary lesion was 67.1 ± 12.7, and the length was 15.35 ± 12.72 mm. **Table 11** describes the VIABAHN® device procedure summary. The majority of the target lesions were treated with only one device. The most frequent device sizes were 8 mm x 5 cm followed by 7 mm x 5 cm. The VIABAHN device was placed across the elbow (antecubital fossa) in 17.2% (25/145) of the subjects.

Table 8. Indication for Procedure

	VIABAHN® Treatment Group	PTA Treatment Group	Overall	p-value
Intent-to-Treat Population	**145**	**148**	**293**	
Indication for Procedure				
N (Data Available)	145	148	293	
Low Blood Flow	47 (32.4%)	39 (26.4%)	86 (29.4%)	0.305 [1]
Elevated Venous Pressure	28 (19.3%)	30 (20.3%)	58 (19.8%)	0.884 [1]
Arm Swelling	4 (2.8%)	8 (5.4%)	12 (4.1%)	0.378 [1]
Prolonged Time to Hemostasis	18 (12.4%)	19 (12.8%)	37 (12.6%)	1.000 [1]
Graft Thrombosis	63 (43.4%)	66 (44.6%)	129 (44.0%)	0.906 [1]
Other	13 (9.0%)	20 (13.5%)	33 (11.3%)	0.268 [1]

Percentages cited are the percentage of subjects out of the data available.
Subject may have multiple indications for procedure.
[1] p-value assesses treatment differences using a two-tailed Fisher's exact test.

Table 9. Target Lesion Characteristics

	VIABAHN® Treatment Group	PTA Treatment Group	Overall	p-value
Intent-to-Treat Population	**145**	**148**	**293**	
Target Lesion Stenosis Percentage	72.8 ± 13.2	74.0 ± 13.0	73.4 ± 13.1	0.403 [1]
Distance from the Venous Anastomosis to the Proximal Edge of the Target Lesion (mm)	4.39 ± 7.32	2.76 ± 5.27	3.56 ± 6.41	0.187 [1]
Total Length of the Target Lesion (mm)	22.36 ± 20.53	24.49 ± 22.34	23.44 ± 21.45	0.385 [1]

[1] p-value assesses treatment differences using a two-tailed Wilcoxon rank-sum test.
Means include ± Standard Deviation

Table 10. Secondary Lesion Characteristics

	VIABAHN® Treatment Group	PTA Treatment Group	Overall	p-value
Intent-to-Treat Population	**145**	**148**	**293**	
Presence of Secondary Lesion	35 (24.1%)	31 (20.9%)	66 (22.5%)	0.576 [1]
Location of Secondary Lesion				0.165 [1]
N (Data Available)	35	31	66	
Intragraft	24 (68.6%)	26 (83.9%)	50 (75.8%)	
Peripheral Vein	11 (31.4%)	5 (16.1%)	16 (24.2%)	
Secondary Lesion Stenosis Percentage				0.792 [2]
N (Data Available)	34	31	65	
Mean (Std Dev)	66.8 ± 14.9	67.6± 9.8	67.2 ± 12.6	
Total Length of the Secondary Lesion (mm)				0.643 [2]
N (Data Available)	35	31	66	
Mean (Std Dev)	16.26 ± 14.28	14.32 ± 10.83	15.35 ± 12.72	

Percentages cited are the percentage of subjects out of the data available.
Means include ± Standard Deviation
[1] p-value assesses treatment differences using a two-tailed Fisher's exact test.
[2] p-value assesses treatment differences using a two-tailed Wilcoxon rank-sum test.

Table 11. VIABAHN Procedure Summary

	VIABAHN Treatment Group
Intent-to-Treat Population	**145**
Number of VIABAHN® Devices Implanted at Procedure	
1	141 (97.2%)
2	3 (2.1%)
3+	1 (0.7%)
Diameter x Length of VIABAHN® Devices	
N (Data Available)	150
6 mm x 5 cm	4 (2.7%)
7 mm x 2.5 cm	3 (2.0%)
7 mm x 5 cm	32 (21.3%)
7 mm x 10 cm	4 (2.7%)
7 mm x 15 cm	3 (2.0%)
8 mm x 2.5 cm	6 (4.0%)
8 mm x 5 cm	76 (50.7%)
8 mm x 10 cm	11 (7.3%)
9 mm x 5 cm	9 (6.0%)
10 mm x 5 cm	2 (1.3%)
VIABAHN® Device Crossed the Antecubital Fossa	25 (17.2%)

Percentages cited are the percentage of subjects out of the data available.

D. Safety and Effectiveness Results

1. Safety Results

The primary analysis of safety was based on the ITT cohort of 293 subjects that completed 24-months of study follow-up or were withdrawn prior to 24 months. The primary safety endpoint of the REVISE study was met. The GORE® VIABAHN® Endoprosthesis group demonstrated statistical non-inferiority as compared to the PTA group for major device-, procedure-, and treatment site-related adverse events through 30 days post-procedure as described in **Table 12** ($p<0.001$).

Adverse effects that occurred in the PMA clinical study:
There were no major device-, procedure-, and treatment site-related adverse events reported during any time interval in the GORE® VIABAHN® Endoprosthesis group.

The proportions of subjects experiencing any major adverse event in the GORE® VIABAHN® Endoprosthesis group and the PTA group are described in **Table 13**. No spontaneous migrations, fractures, malpositions, or deployment failures of the VIABAHN® device were reported as a major adverse event.

The proportions of subjects experiencing any adverse event (major or minor) in the GORE® VIABAHN® Endoprosthesis group and the PTA group are described in **Table 14**. No fractures, malpositions, or deployment failures of the GORE® VIABAHN® Endoprosthesis were reported as a minor adverse event. One iatrogenic (clinician error) migration was reported as a minor adverse event.

There were no reported unanticipated adverse device effects.

Forty-six subjects expired during the course of study follow-up; 23 subjects expired in the GORE® VIABAHN® Endoprosthesis group, 22 subjects expired in the PTA group, and one subject expired in the Non-Randomized group. The DSMB reviewed all study-related deaths and determined that no death was related to the study device or procedure.

No subgroup analyses of safety were performed for the REVISE study.

Table 12. Assessment of the Primary Safety Endpoint Non-Inferiority Test of Major Device, Procedure, and Treatment Site Related Adverse Events Through 30 Days Post-Procedure

	VIABAHN Treatment Group	PTA Treatment Group	p-value
Intent-to-Treat Population	**145**	**148**	
Subjects Experiencing Major Device, Procedure, and Treatment Site Related Adverse Events Through 30 Days Post-Procedure	0 (0.0%)	2 (1.4%)	<0.001 [1]

Percentages cited are the percentage of subjects from the intent-to-treat population.
[1] p-value assesses the non-inferiority of VIABAHN compared to PTA using a one-sided test of non-inferior proportions with delta=0.15

Table 13. Kaplan-Meier Estimates of Major Adverse Events

	VIABAHN Treatment Group						PTA Treatment Group						
	1 mo	3 mo	6 mo	12 mo	18 mo	24 mo	1 mo	3 mo	6 mo	12 mo	18 mo	24 mo	p-value
Intent-to-Treat Population	**145**	**125**	**98**	**74**	**55**	**42**	**148**	**120**	**95**	**81**	**60**	**44**	
Major Adverse Events	**9.3%**	**25.6%**	**37.7%**	**49.6%**	**56.5%**	**63.0%**	**15.3%**	**28.4%**	**37.6%**	**45.1%**	**54.6%**	**61.0%**	**0.905** [1]
Other: Non-Access-Related	7.2%	23.6%	35.8%	47.1%	54.1%	59.8%	12.5%	23.8%	33.4%	41.3%	47.4%	54.3%	0.547 [1]
Infection: Systemic	1.4%	1.4%	4.9%	7.7%	11.2%	12.5%	1.4%	1.4%	3.9%	6.7%	8.9%	8.9%	0.502 [1]
Myocardial Infarction	0.0%	0.0%	1.7%	4.7%	4.7%	7.1%	0.0%	0.8%	0.8%	0.8%	0.8%	0.8%	0.036 [1]
Other: Access-Related	1.5%	3.0%	3.0%	5.9%	5.9%	7.1%	2.1%	3.6%	3.6%	6.7%	8.8%	11.5%	0.362 [1]
Infection: Access-Related	0.0%	0.0%	0.9%	0.9%	0.9%	3.7%	0.7%	2.2%	4.0%	5.0%	6.3%	7.7%	0.130 [1]
Pseudoaneurysm	0.0%	0.7%	0.7%	0.7%	0.7%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.990 [1]
Bleeding: Major	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
Bleeding: Minor	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
Device Deployment Failure	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
Device Fracture	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
Device Malposition	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
Device Migration	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
Dissection	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
Drug Reaction	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	1.1%	0.315 [1]
Embolism, Arterial	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	1.0%	0.315 [1]
Embolism, Pulmonary: Symptomatic	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.8%	0.8%	0.8%	0.8%	0.304 [1]
Heparin Induced Thrombocytopenia	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
Intraprocedural Access Thrombosis	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
Perforation or Rupture	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
Spasm: Intraprocedural	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A

Time intervals for estimates: 1 Month (30 days), 3 Months (91 Days), 6 Months (183 Days), 12 Months (365 days), 18 Months (548 days), 24 Months (730 days).
Percentages cited in the Months columns are Kaplan-Meier estimates for the percentage of subjects having experienced a Major AE.
[1] p-value assesses treatment differences of the Kaplan-Meier curves using a log-rank test.

Table 14. Kaplan-Meier Estimates of All Adverse Events (Major or Minor)

	VIABAHN Treatment Group						PTA Treatment Group						
	1 mo	**3 mo**	**6 mo**	**12 mo**	**18 mo**	**24 mo**	**1 mo**	**3 mo**	**6 mo**	**12 mo**	**18 mo**	**24 mo**	**p-value**
Intent-to-Treat Population	**145**	**118**	**89**	**62**	**40**	**25**	**148**	**107**	**78**	**61**	**44**	**30**	
Adverse Events	**14.9%**	**33.2%**	**48.4%**	**65.3%**	**74.8%**	**78.2%**	**25.4%**	**42.0%**	**54.0%**	**61.3%**	**69.6%**	**80.1%**	**0.501** [1]
Other: Non-Access-Related	9.4%	29.5%	44.2%	60.5%	69.3%	73.7%	21.4%	34.0%	45.9%	54.6%	62.4%	73.5%	0.802 [1]
Other: Access-Related	4.3%	7.2%	9.7%	18.3%	20.4%	24.0%	4.2%	9.4%	11.8%	16.6%	22.0%	28.5%	0.568 [1]
Infection: Systemic	1.4%	1.4%	4.9%	7.7%	11.2%	12.5%	1.4%	1.4%	3.9%	6.7%	8.9%	8.9%	0.502 [1]
Myocardial Infarction	0.0%	0.0%	1.7%	4.7%	4.7%	7.1%	0.0%	0.8%	0.8%	0.8%	0.8%	0.8%	0.036 [1]
Pseudoaneurysm	0.0%	0.7%	1.6%	2.7%	3.8%	6.7%	0.7%	0.7%	3.2%	3.2%	3.2%	4.6%	0.748 [1]
Infection: Access-Related	0.0%	0.0%	0.9%	0.9%	0.9%	3.7%	0.7%	2.2%	4.8%	6.9%	8.2%	9.5%	0.050 [1]
Perforation or Rupture	0.0%	0.8%	0.8%	1.7%	1.7%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.159 [1]
Bleeding: Minor	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.988 [1]
Device Migration	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.314 [1]
Bleeding: Major	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
Device Deployment Failure	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
Device Fracture	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
Device Malposition	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
Dissection	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
Drug Reaction	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	1.1%	0.315 [1]
Embolism, Arterial	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	1.0%	0.315 [1]
Embolism, Pulmonary: Symptomatic	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.8%	0.8%	0.8%	0.8%	0.304 [1]
Heparin Induced Thrombocytopenia	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
Intraprocedural Access Thrombosis	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
Spasm: Intraprocedural	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A

Time intervals for estimates: 1 Month (30 days), 3 Months (91 Days), 6 Months (183 Days), 12 Months (365 days), 18 Months (548 days), 24 Months (730 days).
Percentages cited in the Months columns are Kaplan-Meier estimates for the percentage of subjects having experienced an AE.
[1] p-value assesses treatment differences of the Kaplan-Meier curves using a log-rank test.

2. Effectiveness Results

The primary analysis of effectiveness was based on the ITT cohort of 269 subjects that completed 24 months of study follow-up or were withdrawn prior to 24 months. The primary effectiveness endpoint of the REVISE study was met, with the GORE® VIABAHN® Endoprosthesis group demonstrating statistical superiority of target lesion primary patency over the PTA group as described in **Figure 3** and **Table 15** (p=0.008). The GORE® VIABAHN® Device group extended the median time of target lesion primary patency over PTA by 95 days (88.0%); the median time to loss of target lesion primary patency in the GORE® VIABAHN® Endoprosthesis group was 203 days versus 108 days in the PTA group.

The circuit primary patency of the GORE® VIABAHN® Endoprosthesis and PTA groups, defined as the time interval from initial study treatment to the next access thrombosis or intervention performed within the vascular access circuit, are described in **Table 16**. The median time to loss of circuit primary patency in the GORE® VIABAHN® Endoprosthesis group was 126 days versus 91 days in the PTA group.

The anatomic, clinical, and procedural success rates for the GORE® VIABAHN® Endoprosthesis and PTA groups are described in **Table 17**. These endpoints were defined as:

- Anatomic Success: < 30% residual stenosis following study treatment.
- Clinical Success: The resumption of normal dialysis for at least one session.
- Procedural Success: Composite of anatomic and clinical success endpoints.

The rates of assisted primary patency, access secondary patency, and treatment site secondary patency for the GORE® VIABAHN® Endoprosthesis and PTA groups are described in **Tables 18 – 20**. These endpoints were defined as:

- Assisted Primary Patency: The time interval from initial study treatment to occlusion (thrombosis) of the vascular access circuit.
- Access Secondary Patency: The time interval from initial study treatment to abandonment of the vascular access circuit.
- Treatment Site Secondary Patency: The time interval from initial study treatment to the elimination of the target lesion from the vascular access circuit.

Figure 3. Kaplan-Meier Estimates of Target Lesion Primary Patency

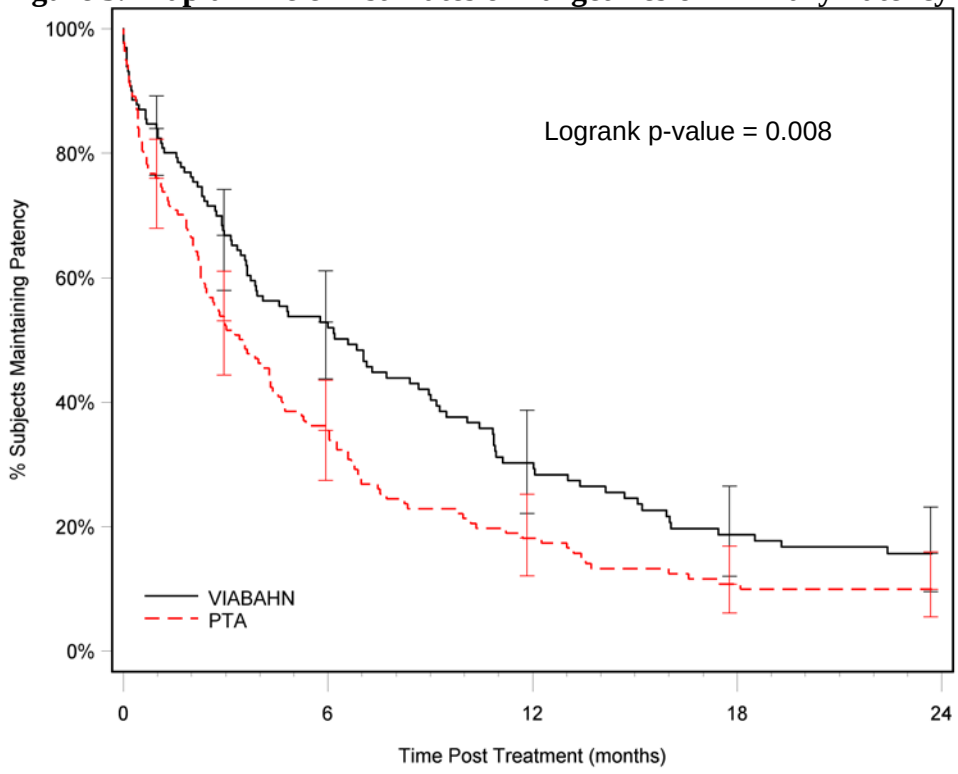


Table 15. Kaplan-Meier Estimates of Target Lesion Primary Patency

Time Post Treatment	N at Risk at Start of Interval	N Events During Interval *	N Censored During Interval *	% Subjects Maintaining Patency	95% Confidence Interval
Group: VIABAHN Device					
Day 0	131	3 (3)	0 (0)	97.7%	(93.1%, 99.3%)
Month 1 (Day 30)	128	18 (21)	2 (2)	84.0%	(76.5%, 89.2%)
Month 3 (Day 91)	108	22 (43)	2 (4)	66.8%	(58.0%, 74.2%)
Month 6 (Day 183)	84	17 (60)	8 (12)	52.9%	(43.8%, 61.1%)
Month 12 (Day 365)	59	25 (85)	2 (14)	30.2%	(22.2%, 38.7%)
Month 18 (Day 548)	32	12 (97)	1 (15)	18.7%	(12.1%, 26.5%)
Month 24 (Day 730)	19	3 (100)	16 (31)	15.7%	(9.6%, 23.2%)
Group: PTA					
Day 0	138	3 (3)	0 (0)	97.8%	(93.4%, 99.3%)
Month 1 (Day 30)	135	30 (33)	1 (1)	76.0%	(67.9%, 82.3%)
Month 3 (Day 91)	104	31 (64)	3 (4)	53.1%	(44.4%, 61.1%)
Month 6 (Day 183)	70	23 (87)	1 (5)	35.5%	(27.4%, 43.6%)
Month 12 (Day 365)	46	22 (109)	1 (6)	18.2%	(12.1%, 25.2%)
Month 18 (Day 548)	23	9 (118)	1 (7)	10.8%	(6.1%, 16.9%)

Time Post Treatment	N at Risk at Start of Interval	N Events During Interval *	N Censored During Interval *	% Subjects Maintaining Patency	95% Confidence Interval
Month 24 (Day 730)	13	1 (119)	12 (19)	9.9%	(5.5%, 15.9%)
Logrank p-value: p=0.008 * Number in parentheses represents cumulative events or censored observations through end of interval Effectiveness population used for analysis.					

Table 16. Kaplan-Meier Estimates of Circuit Primary Patency

Time Post Treatment	N at Risk at Start of Interval	N Events During Interval *	N Censored During Interval *	% Subjects Maintaining Patency	95% Confidence Interval
Group: VIABAHN Device					
Day 0	131	3 (3)	0 (0)	97.7%	(93.1%, 99.3%)
Month 1 (Day 30)	128	22 (25)	2 (2)	80.9%	(73.0%, 86.6%)
Month 3 (Day 91)	104	25 (50)	1 (3)	61.4%	(52.4%, 69.2%)
Month 6 (Day 183)	78	22 (72)	8 (11)	43.4%	(34.6%, 51.9%)
Month 12 (Day 365)	48	24 (96)	2 (13)	21.4%	(14.4%, 29.3%)
Month 18 (Day 548)	22	10 (106)	0 (13)	11.7%	(6.5%, 18.5%)
Month 24 (Day 730)	12	2 (108)	10 (23)	9.6%	(4.9%, 16.1%)
Group: PTA					
Day 0	138	3 (3)	0 (0)	97.8%	(93.4%, 99.3%)
Month 1 (Day 30)	135	30 (33)	1 (1)	76.0%	(67.9%, 82.3%)
Month 3 (Day 91)	104	36 (69)	3 (4)	49.4%	(40.7%, 57.4%)
Month 6 (Day 183)	65	26 (95)	1 (5)	29.4%	(21.9%, 37.3%)
Month 12 (Day 365)	38	18 (113)	1 (6)	15.2%	(9.6%, 21.9%)
Month 18 (Day 548)	19	9 (122)	1 (7)	7.6%	(3.8%, 13.2%)
Month 24 (Day 730)	9	1 (123)	8 (15)	6.8%	(3.2%, 12.1%)
Logrank p-value: p=0.035 * Number in parentheses represents cumulative events or censored observations through end of interval Effectiveness population used for analysis.					

Table 17. Anatomic, Clinical, and Procedural Success

	VIABAHN® Treatment Group	PTA Treatment Group	Overall	p-value
Effectiveness Population	**131**	**138**	**269**	
Anatomic Success	131 (100.0%)	116 (84.1%)	247 (91.8%)	<0.001 [1]
Clinical Success	128 (97.7%)	135 (97.8%)	263 (97.8%)	1.000 [1]
Procedural Success	128 (97.7%)	113 (81.9%)	241 (89.6%)	<0.001 [1]
Percentages cited are the percentage of subjects out of the data available. [1] p-value assesses treatment differences using a two-tailed Fisher's exact test.				

Table 18. Kaplan-Meier Estimates of Assisted Primary Patency

Time Post Treatment	N at Risk at Start of Interval	N Events During Interval *	N Censored During Interval *	% Subjects Maintaining Patency	95% Confidence Interval
Group: VIABAHN Device					
Day 0	131	3 (3)	0 (0)	97.7%	(93.1%, 99.3%)
Month 1 (Day 30)	128	18 (21)	2 (2)	84.0%	(76.5%, 89.2%)
Month 3 (Day 91)	108	22 (43)	2 (4)	66.8%	(58.0%, 74.2%)
Month 6 (Day 183)	84	13 (56)	8 (12)	56.2%	(47.1%, 64.3%)
Month 12 (Day 365)	63	14 (70)	4 (16)	43.5%	(34.5%, 52.1%)
Month 18 (Day 548)	45	10 (80)	3 (19)	33.6%	(25.1%, 42.4%)
Month 24 (Day 730)	32	4 (84)	28 (47)	29.2%	(21.0%, 38.0%)
Group: PTA					
Day 0	138	1 (1)	0 (0)	99.3%	(95.0%, 99.9%)
Month 1 (Day 30)	137	29 (30)	1 (1)	78.2%	(70.3%, 84.2%)
Month 3 (Day 91)	107	21 (51)	4 (5)	62.6%	(53.9%, 70.2%)
Month 6 (Day 183)	82	15 (66)	3 (8)	51.1%	(42.3%, 59.2%)
Month 12 (Day 365)	64	19 (85)	4 (12)	35.3%	(27.1%, 43.6%)
Month 18 (Day 548)	41	5 (90)	2 (14)	30.9%	(23.0%, 39.1%)
Month 24 (Day 730)	34	2 (92)	32 (46)	29.0%	(21.3%, 37.2%)

Logrank p-value: p=0.530

* Number in parentheses represents cumulative events or censored observations through end of interval

Effectiveness population used for analysis.

Table 19. Kaplan-Meier Estimates of Access Secondary Patency

Time Post Treatment	N at Risk at Start of Interval	N Events During Interval *	N Censored During Interval *	% Subjects Maintaining Patency	95% Confidence Interval
Group: VIABAHN Device					
Day	131	3 (3)	0 (0)	97.7%	(93.1%, 99.3%)
Month 1 (Day 30)	128	0 (3)	4 (4)	97.7%	(93.1%, 99.3%)
Month 3 (Day 91)	124	4 (7)	4 (8)	94.5%	(88.8%, 97.3%)
Month 6 (Day 183)	116	4 (11)	12 (20)	91.2%	(84.6%, 95.0%)
Month 12 (Day 365)	100	9 (20)	6 (26)	82.7%	(74.5%, 88.5%)
Month 18 (Day 548)	85	4 (24)	4 (30)	78.8%	(69.9%, 85.3%)
Month 24 (Day 730)	77	9 (33)	68 (98)	68.9%	(59.0%, 76.9%)
Group: PTA					
Day 0	138	0 (0)	0 (0)	100%	(100.0%, 100.0%)
Month 1 (Day 30)	138	7 (7)	3 (3)	94.9%	(89.5%, 97.5%)
Month 3 (Day 91)	128	9 (16)	5 (8)	88.1%	(81.3%, 92.5%)
Month 6 (Day 183)	114	2 (18)	8 (16)	86.5%	(79.5%, 91.3%)
Month 12 (Day 365)	104	9 (27)	11 (27)	78.6%	(70.3%, 84.8%)
Month 18 (Day 548)	84	7 (34)	5 (32)	71.9%	(62.8%, 79.1%)
Month 24 (Day 730)	72	5 (39)	67 (99)	66.6%	(57.1%, 74.6%)

Logrank p-value: p=0.475

* Number in parentheses represents cumulative events or censored observations through end of interval

Effectiveness population used for analysis.

Table 20. Kaplan-Meier Estimates of Treatment Site Secondary Patency

Time Post Treatment	N at Risk at Start of Interval	N Events During Interval *	N Censored During Interval *	% Subjects Maintaining Patency	95% Confidence Interval
Group: VIABAHN Device					
Day 0	131	3 (3)	0 (0)	97.7%	(93.1%, 99.3%)
Month 1 (Day 30)	128	0 (3)	4 (4)	97.7%	(93.1%, 99.3%)
Month 3 (Day 91)	124	5 (8)	3 (7)	93.8%	(87.9%, 96.8%)
Month 6 (Day 183)	116	4 (12)	12 (19)	90.4%	(83.8%, 94.5%)
Month 12 (Day 365)	100	9 (21)	6 (25)	82.1%	(73.8%, 88.0%)
Month 18 (Day 548)	85	4 (25)	4 (29)	78.1%	(69.3%, 84.7%)
Month 24 (Day 730)	77	9 (34)	68 (97)	68.4%	(58.5%, 76.4%)
Group: PTA					
Day 0	138	0 (0)	0 (0)	100%	(100.0%, 100.0%)
Month 1 (Day 30)	138	7 (7)	3 (3)	94.9%	(89.5%, 97.5%)
Month 3 (Day 91)	128	9 (16)	5 (8)	88.1%	(81.3%, 92.5%)
Month 6 (Day 183)	114	2 (18)	8 (16)	86.5%	(79.5%, 91.3%)
Month 12 (Day 365)	104	9 (27)	11 (27)	78.6%	(70.3%, 84.8%)
Month 18 (Day 548)	84	7 (34)	5 (32)	71.9%	(62.8%, 79.1%)
Month 24 (Day 730)	72	5 (39)	67 (99)	66.6%	(57.1%, 74.6%)

Logrank p-value: p=0.554
* Number in parentheses represents cumulative events or censored observations through end of interval
Effectiveness population used for analysis.

Non-Randomized Rupture Group Results

The times to loss of target lesion primary patency in the three non-randomized subjects in the rupture group were 203, 395, and 496 days. Time to loss of circuit primary patency in each of these subjects was 56, 395, and 496 days.

3. Subgroup Analysis

The following preoperative characteristics were evaluated for potential association with effectiveness outcomes. No statistical hypotheses were pre-specified for these subgroups; each of these analyses was post-hoc.

- Gender
- Thrombosis
- Presence of Secondary Lesion
- Repeat Intervention
- Crossing the Elbow (Antecubital Fossa)

Gender

Regardless of gender, target lesion and circuit primary patency was higher in the GORE® VIABAHN® Endoprosthesis group at 6 months as compared to the PTA group. While the study was not originally designed or powered for this analysis, no significant differences in adverse event rates were noted between males and females. The proportion of female subjects enrolled in the study was representative of the overall hemodialysis population and typical of enrollment in hemodialysis access clinical studies.

Thrombosis

Patency outcomes were stratified by the indication for procedure as follows: a) thrombosis and b) non-thrombosis indications. Examples of non-thrombosis indications for study procedure included decreased intragraft blood flow, elevated venous pressures, abnormal physical findings (e.g., arm swelling and prolonged time to hemostasis), or unexplained decrease in delivered dialysis dose.

In the GORE® VIABAHN® Endoprosthesis group, at 6 months, the percentage of thrombotic subjects maintaining target lesion and circuit primary patency was 36.1% and 34.2%. In the PTA group, at 6 months, the percentage of thrombotic subjects maintaining target lesion and circuit primary patency was 23.5% and 21.8%.

In the GORE® VIABAHN® Endoprosthesis group, at 6 months, the percentage of non-thrombotic subjects maintaining target lesion and circuit primary patency was 64.6% and 49.7%. In the PTA group, at 6 months, the percentage of non-thrombotic subjects maintaining target lesion and circuit primary patency was 45.8% and 35.9%.

Presence of Secondary Lesion

Patency outcomes were stratified by the presence or absence of a secondary lesion identified and treated during the initial study procedure.

In the GORE® VIABAHN® Endoprosthesis group, at 6 months, the percentage of subjects enrolled with a secondary lesion maintaining target lesion and circuit primary patency were both 37.1%. In the PTA group, at 6 months, the percentage of subjects enrolled with a secondary lesion maintaining target lesion and circuit primary patency was 30.6 and 26.9%.

In the GORE® VIABAHN® Endoprosthesis group, at 6 months, the percentage of subjects enrolled without a secondary lesion maintaining target lesion and circuit primary patency was 57.0% and 45.1%. In the PTA group, at 6 months, the percentage of subjects enrolled without a secondary

lesion maintaining target lesion and circuit primary patency was 36.7% and 30.0%.

Repeat Intervention

At 24 months, the mean cumulative number of repeat interventions at the target lesion in the GORE® VIABAHN® Endoprosthesis group was 2.688 per subject versus 3.724 per subject in the PTA group.

At 24 months, the mean cumulative number of repeat interventions for the vascular access circuit in the GORE® VIABAHN® Endoprosthesis group was 3.725 per subject versus 5.141 per subject in the PTA group.

Crossing the Elbow (Antecubital Fossa)

Patency data in the GORE® VIABAHN® Endoprosthesis group were stratified by whether or not the treatment crossed the elbow.

When the treatment crossed the elbow, the rate of target lesion primary patency was 72.4% in the GORE® VIABAHN® Endoprosthesis group and 49.2% in the PTA group. The rate of circuit primary patency was 67.3% in the GORE® VIABAHN® Endoprosthesis group and 39.0% in the PTA group.

4. Overall Conclusions from Clinical Data

Data presented in this report provides a reasonable assurance that:
(a) The GORE® VIABAHN® Endoprosthesis is safe and effective when used as intended;
(b) The effectiveness of the GORE® VIABAHN® Endoprosthesis is superior to percutaneous transluminal angioplasty; and
(c) The safety the GORE® VIABAHN® Endoprosthesis is equivalent to percutaneous transluminal angioplasty.

E. Financial Disclosure

The Financial Disclosure by Clinical Investigators regulation (21 CFR 54) requires applicants who submit a marketing application to include certain information concerning the compensation to, and financial interests and arrangement of, any clinical investigator conducting clinical studies covered by the regulation. The pivotal clinical study included 154 investigators of which none were full-time or part-time employees of the sponsor and six (6) investigators had disclosable financial interests/arrangements as defined in 21 CFR 54.2(a), (b), (c) and (f) and described below:

- Compensation to the investigator for conducting the study where the value could be influenced by the outcome of the study: None

- Significant payment of other sorts: six (6) Investigators
- Proprietary interest in the product tested held by the investigator: None
- Significant equity interest held by investigator in sponsor of covered study: None

The applicant has adequately disclosed the financial interest/arrangements with clinical investigators. Statistical analyses were conducted by FDA to determine whether the financial interests/arrangements had any impact on the clinical study outcome. The information provided does not raise any questions about the reliability of the data.

XI. Panel Meeting Recommendation and FDA's Post-Panel Action

In accordance with the provisions of section 515(c)(2) of the act as amended by the Safe Medical Devices Act of 1990, this PMA was not referred to the Circulatory System Devices Panel, an FDA advisory committee, for review and recommendation because the information in the PMA substantially duplicates information previously reviewed by this panel.

XII. Conclusions Drawn From Preclinical and Clinical Studies

A. Effectiveness Conclusions

The primary effectiveness endpoint, target lesion primary patency, was evaluated in 269 subjects and was statistically superior for the GORE Viabahn Endoprosthesis as compared to PTA (median time of 203 days vs. 108 days). Therefore, the primary effectiveness endpoint was met and the results demonstrate a reasonable assurance of device effectiveness.

B. Safety Conclusions

The risks of the device are based on previously conducted non-clinical laboratory and animal studies, as well as on data collected in a clinical study to support PMA approval as described above. The primary safety endpoint of the clinical study, the rate of major device-, procedure-, and treatment site-related adverse events through 30 days post-procedure, was evaluated in 293 subjects and was statistically non-inferior for the GORE® VIABAHN® Endoprosthesis as compared to PTA (0.0% vs. 1.4%). Therefore, the primary safety endpoint was met and the results demonstrate a reasonable assurance of device safety.

C. Benefit-Risk Conclusions

The probable benefits of the device are also based on data collected in a clinical study conducted to support PMA approval as described above. The probable benefit of the GORE® VIABAHN® Endoprosthesis in improving the

ability to perform hemodialysis access outweigh the probable risks associated with use of the device.

Patient follow-up from the pivotal clinical study was satisfactory and with limited missing data, and the study endpoints were clinically meaningful. The study results are superior to the results of balloon angioplasty alone. Follow-up for the PMA was 24 months, which allows for sufficient evaluation of the durability and long-term safety of the stent-grafting procedure.

Many patients receive long-term hemodialysis due to kidney failure or other chronic, incurable conditions that can greatly affect their quality of life. Alternative treatments for hemodynamic failures of hemodialysis access pathways, including the use of other interventional devices, were carefully considered. The use of endovascular stent-grafts such as the GORE® VIABAHN® Endoprosthesis has the potential to improve the ability to perform hemodialysis with less need for repeat revascularization or access establishment procedures, the reduction of which is highly valued by physicians and patients. Patient risk is minimized via appropriate patient selection and device usage, as communicated in the physician labeling.

In conclusion, given the available information above, the data support that for the treatment of stenosis or thrombotic occlusion at the venous anastomosis of synthetic arteriovenous (AV) access grafts, the probable benefits outweigh the probable risks.

D. Overall Conclusions

The data in this application support the reasonable assurance of safety and effectiveness of this device when used in accordance with the indications for use.

The safety and effectiveness of the treatment of stenotic or thrombotic arteriovenous access grafts with the GORE® VIABAHN® Endoprosthesis has been established with the REVISE study, in conjunction with non-clinical testing previously conducted. The primary safety and effectiveness endpoints for the REVISE study were met. The primary effectiveness analysis demonstrates significantly higher target lesion primary patency for the device, as compared to PTA. The primary safety analysis demonstrates comparable adverse event rates for the device and PTA. Key secondary analyses provided additional demonstration of device safety and effectiveness. Taken together, these data confirm that the overall clinical benefit outweighs the overall clinical risk for the approved indications for use.

XIII. CDRH Decision

CDRH issued an approval order on December 5, 2013.

The applicant's manufacturing facilities have been inspected and found to be in compliance with the device Quality System (QS) regulation (21 CFR 820).

XIV. **Approval Specifications**

Directions for use: See device labeling.

Hazards to Health from Use of the Device: See Indications, Contraindications, Warnings, Precautions, and Adverse Events in the device labeling.

Post-approval Requirements and Restrictions: See approval order.