SUMMARY OF SAFETY AND EFFECTIVENESS DATA (SSED)

I. GENERAL INFORMATION

Device Generic Name: Embolization Agent, Vascular

Device Trade Name: Embrace® Hydrogel Embolic System (HES)

Device Product Code: QVG

Applicant's Name and Address: Instylla, Inc.
201 Burlington Rd
North Building
Bedford, MA 01730

Date(s) of Panel Recommendation: None

Premarket Approval Application (PMA) Number: P250003/S008

Date of FDA Notice of Approval: 10/23/2026

The original PMA (P250003) for the Embrace® Hydrogel Embolic System (HES) was approved on August 5, 2025 with the following indication: The Embrace HES is indicated for embolization of hypervascular tumors in peripheral arteries ≤5mm. The SSED to support this indication is available on the CDRH website (https://www.accessdata.fda.gov/cdrh_docs/pdf25/P250003B.pdf) and is incorporated here for reference.

The current supplement was submitted to expand the indications for use for the Embrace® Hydrogel Embolic System (HES) to include embolization of peripheral arterial bleeds in vessels ≤ 6mm.

II. INDICATIONS FOR USE

The Embrace HES is indicated for embolization of hypervascular tumors in peripheral arteries ≤5mm and peripheral arterial bleeds in vessels ≤ 6mm.

III. CONTRAINDICATIONS

The Embrace HES is contraindicated for use in:

- Patient is intolerant to occlusion procedures
- Vascular anatomy or blood flow precludes correct catheter placement or embolic injection
- Presence or likely onset of unresolvable vasospasm

- Known or suspected conditions that would prevent successful catheterization of targeted vasculature
- Presence of bilioenteric anastomoses or prior biliary interventions with stenting
- Presence of collateral vessel pathways which could potentially endanger non-target tissue
- Vascular resistance proximal to the feeding arteries precluding passage of Embrace HES into the lesion
- In large-diameter arteriovenous shunts (i.e. where the blood does not pass through an arterial/capillary/venous transition but directly from an artery to a vein) in the pulmonary vasculature
- Any neurovasculature or coronary location
- Known allergies to polyethylene glycol (PEG), ferrous compounds, tert Butyl Hydroperoxide, that are not amenable to pre-medication

IV. WARNINGS AND PRECAUTIONS

The warnings and precautions can be found in the Embrace HES labeling.

V. DEVICE DESCRIPTION

The Embrace® Hydrogel Embolic System (HES) is a polyethylene glycol diacrylate (PEGDA) based hydrogel that forms in blood vessels by delivering two aqueous precursor solutions, the Polymer Precursor and Initiator Precursor, via FDA-cleared microcatheters assembled to form a coaxial dual-lumen system, as described in the Instructions for Use.

The formed hydrogel acts as a vascular embolic by providing a mechanical barrier to blood flow. The Embrace HES is provided sterile and intended for single use only.

The Embrace HES is a biocompatible, hydrophilic, persistent, hydrogel produced from polyethylene glycol. The HES is available as a two-part system that forms *in situ* at the target location. Embrace is designed to offer controlled, targeted embolization utilizing the Instylla Microcatheter and Instylla™ Delivery Kit. The contents are described in **Table 1** and **Figure 1**.

Table 1. Embrace HES Contents

	Item	Description	Quantity
Accessory Kit	A	Syringe 1A – 3mL (Light Blue)	1
	B	Syringe 2A – 10mL (Yellow)	1
	C	Female-to-female Luer Connector	1
Precursor Kit	D	Vial 1C with attached Vial Spike	1
	E	Vial 1B with attached Vial Spike	1
	F	Vial 2B with attached Vial Spike	1
	G	Vial Holder (front and back halves)	1

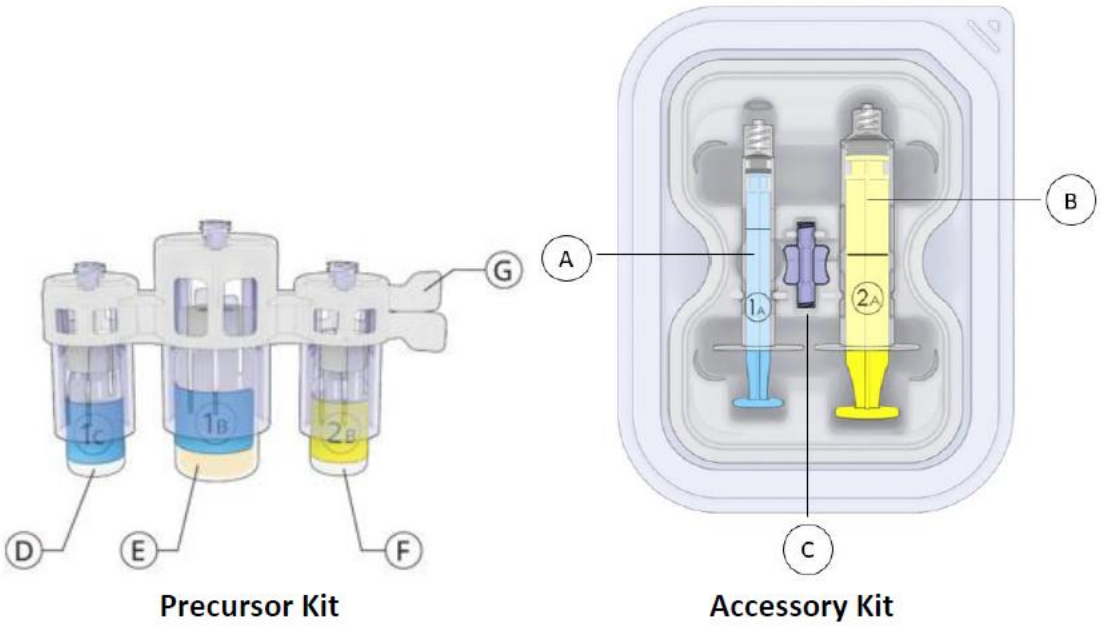


Figure 1. Embrace HES

Devices and Accessories Needed to Perform the Procedure

- Instylla Microcatheter (1.7F or 1.2F)
- Instylla Delivery Kit
- Commercially available microcatheter (inner diameter ≥0.027 inch for use with 1.7F Instylla Microcatheter or ≥0.021 inch for use with 1.2F Instylla Microcatheter) with guidewire
- Aqueous, non-ionic iodinated contrast medium (triiodobenzene-based) having ≥ 300mg Iodine per mL with viscosity less than 26 cP at 20°C
- 0.014" guidewire (for use with 1.7F Instylla Microcatheter) or 0.010" guidewire (for use with 1.2F Instylla Microcatheter)

VI. ALTERNATIVE PRACTICES AND PROCEDURES

There are several other alternatives for the embolization of hypervascular tumors and hemorrhage control. These include coils, plugs, microspheres and particles. 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 Embrace Hydrogel Embolic System (HES) with the hypervascular tumor indication has been commercially available in the United States since FDA approval on August 5, 2025.

The device has not been withdrawn from marketing for any reason related to safety or effectiveness.

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.

- Paralysis resulting from non-targeted embolization or ischemic injury from adjacent tissue edema
- Inadvertent embolization of a non-target vessel or territory
- Pulmonary embolism due to arterial venous shunting
- Thrombosis
- Ischemia, infarction, or tissue necrosis at an undesirable location
- Vessel or lesion rupture and hemorrhage
- Vasospasm
- Air embolism
- General edema
- Hypotensive crisis
- Embolization failure or recanalization requiring secondary intervention
- Foreign body reactions or infection necessitating medical intervention
- Complications related to catheterization (e.g., hematoma at the site of entry, clot formation at the tip of the catheter and subsequent dislodgment, nerve and/or circulatory injuries, or vessel trauma [e.g. dissection, perforation, rupture])
- Pain and/or rash, possibly delayed from the time of embolization
- Post-embolization syndrome
- Toxic or allergic reactions to embolic material
- Death

For the specific adverse events that occurred in the clinical study, please see Section X and Section XI below.

IX. SUMMARY OF NON-CLINICAL STUDIES

Because the formulation is identical to the formulation approved in the original PMA P250003, most of the non-clinical studies are leveraged, including material characterization, delivery performance, biocompatibility, and sterilization. Please see the P250003 SSED for details of the non-clinical testing that was conducted. In addition, a series of non-clinical studies were performed to evaluate the new indication for peripheral bleeds.

A. Bench Top Studies

Table 2 describes the bench testing conducted at baseline and at the shelf life of 2 years for peripheral bleeds.

Table 2. Bench Testing

Study	Test Method	Acceptance Criteria	Results and Conclusions
Simulated Use	No directly applicable Standard test method. An OTS microcatheter with guidewire was advanced through a model to the specified location. Coupled with a Tuohy Borst, the Instylla Microcatheter was coaxially placed through the OTS microcatheter until it exited the distal end of the OTS. The Embrace HES was delivered through the Coaxial delivery system.	Delivery of the hydrogel embolic creates an effective embolic while keeping non-target vessels patent.	The Embrace HES met the acceptance criteria for simulated use testing.

B. Biocompatibility

Embrace HES is classified as an implant device contacting circulating blood for a long-term duration (>30 days).

A toxicological risk assessment was conducted on five full Embrace HES Kits (7.5 mL per kit). The risk of genotoxicity, systemic toxicity, and carcinogenicity from potential exposure to extracted chemicals was negligible for the worst-case dose of 37.5 mL Embrace HES (5 full Embrace HES Kits, 7.5 mL per kit). *Note: The maximum dose referenced above is higher than in the original PMA (P250003)*

The Embrace HES may not polymerize in clinical conditions with high flow, shunting, and/or reflux leading to increased exposure to Embrace HES precursor solutions. Tert-butyl hydroperoxide is a component of the precursor solution.

Scientific literature supports that TBHP is sensitizing in animals[1], and sensitizers are capable of inducing a hypersensitivity reaction upon repeated contact (Clause 3.1 of ISO 10993-10:2021). A patient's susceptibility to a sensitization reaction is dependent on repeat exposure to the chemical. Therefore, although the Precursor Solutions were non-sensitizing in the GPMT study, the patient may be further exposed to TBHP with repeat device use or other exposure outside of the procedure. Therefore, communication of the potential health risks from exposure to TBHP is included in the labeling.

Scientific literature demonstrates TBHP is genotoxic in vitro and in vivo[1]. TBHP is a well-known oxidative DNA-damaging agent.

The instructions for use for the Embrace HES include procedures to minimize instances of non-polymerization of the HES, including the indications for use limiting to ≤ 6mm for hemorrhage control and warning against use in conditions of high flow, shunting, and/or reflux.

The following warning is included in the labeling: "Tert-butyl hydroperoxide (TBHP), a component of the precursor solution, elicits genotoxicity and sensitization in animals." Additionally, a contraindication is included for patients with known allergy to TBHP.

C. Animal Studies

Table 3 describes the animal studies that were conducted to provide evidence of the safety and efficacy of the Embrace HES in arterial bleeds.

Table 3. Animal Studies

Description	Results
A Non-GLP Chronic Study of Embolization of Peripheral Bleeds in the Porcine Model The efficacy and durability of the HES for use in hemorrhage control was evaluated in peripheral bleeds created in the mesenteric artery region of swine survived to 7 days.	The HES was effective in hemorrhage control. All bleeds were successfully treated. No rebleeds were noted for the duration of the study (7 days).
A Non-GLP Chronic Study of Embolization of Peripheral Bleeds in the Porcine Model The embolization of bleeding peripheral arteries in the mesenteric artery region of swine survived to 7 days was assessed.	All bleeds were treated successfully with HES as confirmed by post-embolization angiogram. Angiograms performed on Day 7 on treated regions identified no bleeding recurrence.
A Chronic Study of Embolization of Arterial Bleeds in the Porcine Model The embolization of bleeding renal arteries in the swine model treated with the HES was assessed. The healing mechanisms of injured tissue in the presence of HES and the HES/blood interaction zone at 30 days was evaluated.	This study successfully assessed embolization of bleeding renal arteries (both acute and durability at 30 days), the healing mechanisms of injured tissue in the presence of HES at 30 days, and evaluated the proximal HES/blood interaction zone at 30 days in the swine model.
Acute Evaluation of Embrace HES in a Swine Hemorrhage Model The embolization of bleeding arteries in the kidney and liver of swine was evaluated.	Instylla HES delivered through the 1.2F Microcatheter and 1.7F Microcatheter achieved 100% embolization success in a preclinical swine model for hemorrhage control.
Preclinical Swine Lab – Acute Assessment of Embrace HES in a Swine Hemorrhage Model The embolization of bleeding arteries in the kidney and liver of swine was evaluated.	Instylla HES delivered through the 1.2F Microcatheter and 1.7F Microcatheter achieved 100% embolization success in a preclinical swine model for hemorrhage control.

X. SUMMARY OF PRIMARY CLINICAL STUDY

The applicant performed a pivotal clinical study called the HALT Study (Prospective Multicenter Single-Arm Staged Study to Evaluate the Safety and Effectiveness of Embrace Hydrogel Embolic System (HES) For Transcatheter Embolization of Arterial Bleeding in Solid Organs and Peripheral Arteries) to establish a reasonable assurance of safety and effectiveness for the Embrace HES under IDE G210241. This study was conducted to expand the indications for the Embrace HES to include embolization of peripheral arterial bleeds in vessels ≤ 6mm. Data from this clinical study were the basis for the PMA approval decision.

A. Study Design

The HALT study was a prospective, multicenter, single-arm clinical study conducted to evaluate the safety and effectiveness of the Embrace Hydrogel Embolic System (HES) for the transcatheter embolization of peripheral arterial bleeds. Patients were treated between December 16, 2022, and October 27, 2025. The database for this PMA reflected data through November 24, 2025, and included 130 patients. There were 22 investigational sites, all located in the United States (US).

The primary safety endpoint evaluated freedom from major adverse events (MAEs) through 30 days post-index procedure against a literature-derived performance goal (PG). The Primary Effectiveness endpoint evaluated clinical success at 30 days against a literature-derived performance goal.

Safety data was reviewed and adjudicated by a Clinical Events Committee (CEC). The Data Monitoring Committee (DMC) was responsible for interim review of safety data and responsible for reviewing data from the sample size re-estimation analyses.

1. Clinical Inclusion and Exclusion Criteria

Enrollment in the Embrace HES study was limited to patients who met the following inclusion criteria:

1. Male or female patients age ≥ 18 years old
2. Subjects who are candidates for transarterial catheter embolization with arterial bleeding documented on a suitable radiologic imaging and/or endoscopic visualization study taken during the index hospitalization that allows for the source of the arterial injury/bleeding to be localized. Includes (but not limited to) the following:
    a. Non-variceal Upper Gastrointestinal (UGI) bleeds refractory to endoscopic treatment
    b. End organ/visceral bleeds (kidney, liver and spleen including tumor bleeds)
    c. Spontaneous hematoma (e.g., rectus sheath and psoas muscle hematomas)
    d. Other peripheral arterial bleeds (e.g., pelvic hemorrhage) if not associated with risk of ischemia distal to the lesion or embolization of non-expendable arteries.
3. Subjects with at least one target vessel ≤ 6mm and Embrace HES can be delivered to the target vessel(s).
4. Subject is willing to comply with follow-up evaluation schedule.
5. No prior embolization in the target territory prior to index procedure
6. The subject or a legally authorized representative (LAR) has provided informed consent approved by the appropriate local IRB.

Patients were not permitted to enroll in the Embrace HES study if they met any of the following exclusion criteria:

1. Life expectancy ≤ 30 days
2. In the Investigator's opinion, due to injury severity the subject is not likely to benefit from angioembolization (e.g., in the presence of significant polytrauma, multiple organ failure or shattered organs).
3. Any contraindication to arteriography or the embolization protocol utilized at treating institution.
4. Pregnant or breast-feeding or planning pregnancy within the next 6 months (women of child-bearing potential must undergo a pregnancy test performed in accordance with local institutional requirements).
5. Hemorrhagic shock (Class IV) at time of treatment
6. Target vascular territory supplied by the pulmonary artery, coronary artery, or cerebral or cerebellar artery (requiring embolization of these arteries) or the artery to be embolized has connections to these arteries via a collateral pathway.
7. Embolization for treatment of spinal arteries, lower GI bleeds, arteriovenous malformations, embolization of arteriovenous shunts, endoleak management, neurovascular bleeds, penetrating trauma of extremities.
8. Forrest Classification Type III UGI bleeds
9. In the investigator's opinion, patient will require embolization of 4 or more discrete vascular territories/arterial injuries (requires that microcatheter be repositioned to discrete area) based on diagnostic angiography or another suitable imaging study.
10. Known or suspected angio-anatomical conditions that in the Investigator's opinion, would prevent the delivery catheter to gain access to the selected position for safe and intended embolization.
11. Known allergies (based on history) to PEG, ferrous compounds, tert Butyl Hydroperoxide, contrast media or procedural sedatives/anesthetics that is not amenable to pre-medications
12. Presence of medically relevant localized or systemic infection.
13. The patient has other concurrent conditions or known history that in the opinion of the Investigator would be unlikely to receive clinical benefit from the study procedure or participation in the study may compromise patient safety or study objectives (including but not limited to ongoing acute infection, life-threatening concomitant trauma or conditions)
14. Presence of Uncorrectable Coagulopathy: Defined as thrombocytopenia with platelet counts < 40,000/mm^3 and/or INR > 2.0.
15. If known, enrollment in a concurrent study in which the study treatment may confound the evaluation of the study device.

Subjects deemed unsuitable for arterial embolization due to contraindicative findings during the pre-embolization angiography and were considered intraoperative (secondary) screen failures included:

1. Incidental finding of pre-procedure exclusionary criteria
2. Vascular anatomy precludes catheter placement, or safe Embrace Hydrogel Embolic administration was not possible

2. Follow-up Schedule

All enrolled subjects were evaluated at hospital discharge and scheduled to return for follow-up examinations at 30 (± 5) days after the index procedure. The Schedule of Events and Assessments conducted during this trial is summarized in **Table 4.**

Table 4. Schedule of Events and Assessments

Procedure	**Pre-Index Procedure Assessments** (within 2 days prior to Index Procedure)	**Arterial Embolization Procedure**	**Post-Index Procedure through Discharge****	**Within 24 hours Prior to Discharge** (if before Day 30)	**Follow-up: Day 7 ± 3 days***** (Phone /Remote contact)	**Follow-up: Day 30±5 days**
Demographic Information	✓					
Indication for Arterial Embolization	✓					
ASA/APACHE/ and Trauma/Organ Injury Scale Scores as appropriate and practicable	✓					
Forrest Classification for UGI bleeds	✓					
Hemorrhagic Shock Score	✓					
Injury Characteristics/Target organ injury data or lesion characteristics as applicable	✓					
Vital Signs (blood pressure, pulse, respiratory rate, temperature)	✓			✓		
Primary Survey or Directed Physical Exam (as practicable)	✓					
Hematology, including CBC (w/ differential), hematocrit, hemoglobin, WBC, RBC, and platelet	✓ (To the extent available if trauma)			✓		

Procedure	Pre-Index Procedure Assessments (within 2 days prior to Index Procedure)	Arterial Embolization Procedure	Post-Index Procedure through Discharge**	Within 24 hours Prior to Discharge (if before Day 30)	Follow-up: Day 7 ± 3 days*** (Phone /Remote contact)	Follow-up: Day 30±5 days
count, BUN and creatinine.						
Presence of Coagulopathy / Use of Anticoagulants	✓	✓*				
Pregnancy test for women of childbearing age (per institutional requirements)	✓	✓ (as required)				
Diagnostic Confirmation of Arterial Injury/Bleed via Imaging (Endoscopy or CT/Conventional Angiography as appropriate)	✓		✓(for suspected rebleeds)	✓(for suspected rebleeds)		✓(for suspected rebleeds)
CT, CBCT, or conventional Angiography**		Pre- and Post-Embolization Procedure				
Embolization Procedural Details		✓				
Concomitant Therapies for Bleeding Control	✓ (limited to that performed within 24 hours of treatment)	✓	✓	✓	✓	✓
Evaluation of Clinical signs and symptoms of rebleeding			✓	✓		✓
Adverse Events		✓	✓	✓	✓	✓
*Uncorrectable coagulopathy per the protocol definition is an exclusion criterion **When an embolic is used prior to administration of Embrace HES, imaging is required to enable determination of flow and/or stasis within the target vessel prior to the treatment with Embrace HES ***not necessary if patient remains hospitalized on or after Day 7 visit window						

3. Clinical Endpoints

The primary safety endpoint evaluated freedom from major adverse events (MAE) through 30 days (± 5 days) post-index procedure, as adjudicated by the independent CEC, compared with a literature-derived performance goal (PG) of 80%.

The following events were considered MAE if deemed by the CEC to be 'definitely' device and/or procedure-related or 'probably' device and/or procedure related and satisfies the severity criteria for a Grade ≥ 3 event, classified in accordance with the 2017 Society for Interventional Radiology (SIR) Guidelines.

- Non-target embolization (NTE) confirmed radiographically
- Bowel ischemia (confirmed endoscopically and/or radiographically) for patients treated for Upper GI bleeds
- Toxic and/or Allergic reactions to the Embrace hydrogel manifested as immediate anaphylaxis or acute kidney injury (AKI - severe azotemia, oliguria and/or anuria) with no other apparent etiology; e.g., contrast sensitivity)

The primary effectiveness endpoint for this study was Clinical Success defined as the absence of bleeding from the target lesion after embolization with Embrace HES without the need for subsequent embolic devices in the index procedure, emergency surgery, re-embolization or other target vessel re-interventions due to rebleeding within 30 days (± 5 days) of the index procedure. Target vessel rebleeds had to be confirmed radiologically or endoscopically (as appropriate). The goal was to demonstrate that clinical success with Embrace HES was superior to a pre-specified Performance Goal (PG) of 65% for UGI subjects and 80% for non-UGI subjects, representative of conventional arterial embolic agents (e.g., gelatin sponges, metallic coils, plugs, and embolization particles) used for transcatheter arterial embolization as reported in the literature.

- Technical success was also documented and was defined as occlusion of the target vessel or exclusion of the area of arterial damage and/or the cessation of extravasation on postembolization angiography following Embrace HES administration as determined by an independent Imaging Core lab.
- Radiologic and endoscopic images obtained for the purposes of diagnosing target vessel rebleeding were made available for review by the Imaging Core lab with final adjudication of rebleeds determined by the Clinical Events Committee (CEC).

B. Accountability of PMA Cohort

Between December 16, 2022, and October 27, 2025, 130 subjects underwent embolization with Embrace HES and comprised the Full Analysis Population (FAS). Overall, 81.5% (106/130) of treated subjects completed the study having undergone the Day 30 visit. Early termination or withdrawal occurred in 18.5% (24/130) of subjects. Deaths (all-cause mortality) accounted for 10.8% (14/130) of treated subjects. No subject withdrew consent, and there were no discontinuations due to adverse events, investigator decision, or study termination. Subject Disposition is summarized in **Table 5**.

Table 5. Subject Disposition Consented Subjects

	Overall
Index Embolization Procedure	100.0% (130/130)
Completed Study[1]	81.5% (106/130)
Early Termination/Withdrawal [2]	18.5% (24/130)
Lost to Follow-up	7.7% (10/130)

	Overall
Investigator Elected to Withdraw Subject	0.0% (0/130)
Death	10.8% (14/130)
[1] A subject is considered to have completed the study if he/she completed all visits through Day 30 Follow-up visit. [2] The number and percentage of subjects prematurely withdrawing is based on the Full Analysis Population	

Study populations included: Evaluable Population (EP) comprised all treated subjects who received the study intervention and were evaluable for the primary effectiveness endpoint; this population served as the primary effectiveness analysis set. The Full Analysis Population (FAS) included all enrolled and treated subjects and was used for the primary safety analyses. The Per Protocol (PP) Population consisted of subjects in the EP without major protocol deviations that could impact safety or effectiveness assessments. This population was secondary for the primary effectiveness evaluation.

The full analysis population (FAS) was comprised of 130 treated subjects, including 118 Non-UGI and 12 UGI subjects. Of these, 84.6% (110/130) met criteria for inclusion in the Evaluable Population (EP) for the primary effectiveness analysis. Ten (10) subjects were excluded from the primary effectiveness analysis because they were lost to follow-up with no 30-day visit. An additional ten (10) subjects were excluded from the primary effectiveness analysis due to death before the 30-day visit. *Note: The evaluable population for the primary effectiveness analysis (110/130) included 4 subjects who did not complete the study but experienced primary effectiveness endpoint failure.*

Of the 130 subjects in the FAS population, 106 (81.5%) were included in the analysis for the primary safety endpoint. Early termination or withdrawal occurred in 24 (18.5%) subjects in the FAS population, excluding them from the analysis for the primary safety endpoint with fourteen (14) deaths prior to day 30 and ten (10) subjects lost to follow-up.

C. Study Population Demographics and Baseline Parameters

Overall, subjects had a mean age of 58.0 years and were predominantly male (63.1%). Most subjects identified as White (66.9%), followed by Black or African American (17.7%). Approximately 27.1% of subjects identified as Hispanic or Latino demonstrating an ethnically diverse population. At baseline, subjects generally presented with moderate to severe illness. Most subjects were classified as ASA Physical Status II (43.1%) or III (40.8%), with hemorrhagic shock scores of II or III (53.5%). Presence of coagulopathy (16.9%) was also documented. See

Table 6.

Table 6. Demographic Characteristics and Health History

	Overall N=130
Age (years)	
Mean ± SD (N)	58.0 ± 18.91 (130)
Median (Min, Max)	61.0 (18.0, 93.0)
Sex	
Male	63.1% (82/130)
Female	36.9% (48/130)
Race [1]	
American Indian or Alaska Native	1.5% (2/130)
Asian	3.8% (5/130)
Asian Indian	0.8% (1/130)
Black or African American	17.7% (23/130)
Filipino	1.5% (2/130)
White	66.9% (87/130)
Other	9.2% (12/130)
Ethnicity	
Hispanic or Latino	27.1% (35/129)
Not Hispanic or Latino	72.9% (94/129)
BMI (kg/m^2)	
Mean ± SD (N)	28.4 ± 5.74 (129)
Median (Min, Max)	27.0 (16.0, 48.5)
American Society of Anesthesiologist (ASA) Physical Status Classification	
ASA I	3.1% (4/130)
ASA II	43.1% (56/130)
ASA III	40.8% (53/130)
ASA IV	10.0% (13/130)
ASA V	1.5% (2/130)
ASA VI	0.0% (0/130)

	Overall N=130
Unknown	1.5% (2/130)
APACHE II Score	
Mean ± SD (N)	11.7 ± 7.31 (28)
Median (Min, Max)	10.0 (0.0, 26.0)
Forrest classification for UGI bleeds	
Forrest Ia (Spurting hemorrhage)	25.0% (3/12)
Forrest Ib (Oozing hemorrhage)	25.0% (3/12)
Forrest IIa (Nonbleeding Visible vessel)	16.7% (2/12)
Forrest IIb (Adherent clot)	0.0% (0/12)
Forrest IIc (Flat pigmented haematin [coffee ground base] on ulcer base)	0.0% (0/12)
Forrest III (Lesions without signs of recent hemorrhage or fibrin-covered clean ulcer base)	0.0% (0/12)
Unknown	33.3% (4/12)
AAST Trauma Organ Injury Scale Score	
Mean ± SD (N)	3.0 ± 1.22 (40)
Median (Min, Max)	3.0 (1.0, 5.0)
Hemorrhagic Shock Scale Score	
Class I	46.5% (59/127)
Class II	32.3% (41/127)
Class III	21.3% (27/127)
Class IV	0.0% (0/127)
Anticoagulant Use	
Yes	33.8% (44/130)
No	58.5% (76/130)
Unknown	7.7% (10/130)
Presence of Coagulopathy [2]	
Yes	16.9% (22/130)

	Overall N=130
No	83.1% (108/130)

[1] More than one race may be selected per a subject. Therefore, numbers may add up to greater than the total.

[2] Presence of Coagulopathy: Defined as thrombocytopenia with platelet counts 45 seconds and/or INR > 1.5.

Overall, current baseline medical history demonstrates a medically complex population with a high prevalence of active cardiovascular (75.5%), gastrointestinal (62.8%), hematologic (60.9%), renal (60.0%), and metabolic comorbidities (65.5%). This profile is consistent with patients typically managed with TAE for acute arterial bleeding. A summary is provided in **Table 7**.

Table 7: Baseline Medical and Surgical History

	Number of Events N	Number of Subjects with Events % (n/N)
Available Medical & Surgical History	1711	99.1% (109/110)
Allergies	3	2.7% (3/110)
Cardiovascular	336	75.5% (83/110)
Dermatological	36	19.1% (21/110)
EENT	42	22.7% (25/110)
Endocrine/Metabolic	174	65.5% (72/110)
Gastro-intestinal	251	68.2% (75/110)
Genito-urinary/Reproductive	154	60.0% (66/110)
Haemopoietic/Lymphatic	132	60.9% (67/110)
Immunological	25	17.3% (19/110)
Musculoskeletal	232	74.5% (82/110)
Neurological	89	40.9% (45/110)
Other	57	30.9% (34/110)
Psychological	50	30.9% (34/110)
Respiratory	130	57.3% (63/110)

Bleed characteristics are presented in **Table 8**. Emergent or traumatic bleeding occurred in approximately 60% of cases. Bleeds were classified as end organ/visceral bleeds (52.3%), Upper Gastrointestinal (UGI) bleeds (exclusively non-variceal UGI) (9.2%), spontaneous hematoma (11.5%) and other peripheral bleeds (26.9%) primarily made up of bleeding sources from branch vessels in soft-tissue, pelvic, retroperitoneal, and extremity regions rather than discrete solid organs. These bleeding presentations were associated with traumatic, iatrogenic, or spontaneous etiologies.

Table 8. Bleed Characteristics by UGI Status

	Overall N=130
Emergent/Traumatic Bleed	
Yes	60.8% (79/130)
No	39.2% (51/130)
INR (Ratio)	
Mean ± SD (N)	1.3 ± 0.45 (127)
Median (Min, Max)	1.2 (0.9, 4.3)
Type of Bleed Identified	
Non-variceal Upper Gastrointestinal (UGI) bleed	9.2% (12/130)
End Organ/Visceral Bleeds	52.3% (68/130)
Kidney	29.4% (20/68)
Liver	26.5% (18/68)
Spleen	36.8% (25/68)
Other	7.4% (5/68)
Spontaneous Hematoma	11.5% (15/130)
Rectus Sheath	80.0% (12/15)
Psoas Muscle Hematomas	13.3% (2/15)
Missing	6.7% (1/15)
Other Peripheral Arterial Bleeds	26.9% (35/130)
Target Organ	
Kidney	16.2% (21/130)
Liver	13.8% (18/130)

	Overall N=130
Spleen	20.0% (26/130)
Upper GI	9.2% (12/130)
Other	40.8% (53/130)
Injury/Lesion Etiology	
Puncture	1.5% (2/130)
Laceration	6.9% (9/130)
Blunt trauma	13.8% (18/130)
Surgery	2.3% (3/130)
Biopsy	1.5% (2/130)
Pseudoaneurysm	19.2% (25/130)
Other	54.6% (71/130)

D. Safety and Effectiveness Results

1. Safety Results

The primary safety endpoint was freedom from major adverse events (MAE) through 30 days post index procedure (as adjudicated by the CEC) compared with a literature-derived performance goal (PG) of 80%. The primary safety analysis included only those subjects deemed evaluable which was 106 of the 130 subjects treated with Embrace HES. Early termination or withdrawal occurred in 24 of the 130 subjects treated with Embrace HES excluding them from the primary safety analysis with fourteen (14) deaths prior to day 30 and ten (10) subjects lost to follow-up. The primary safety endpoint was achieved in 100% of evaluable subjects (0/106 MAEs). No MAEs were reported, including no instances of non-target embolization, bowel ischemia, or toxic or allergic reactions attributable to the Embrace hydrogel. The lower bound of the one-sided 95% confidence interval for freedom from MAEs; i.e., 97.21%, exceeded the prespecified performance goal of 80%, and the exact binomial test demonstrated statistical significance ($p < 0.001$). The Primary Safety Endpoint analysis is presented in **Table 9**.

Table 9. Primary Safety Endpoint

	Number of Events N	Number of Subjects with Events %(n/N)
Primary Safety Endpoint [1, 2, 3]	0	0.0% (0/106)
Non-target embolization (NTE)	0	0.0% (0/106)
Bowel ischemia	0	0.0% (0/106)

	Number of Events N	Number of Subjects with Events %(n/N)
Toxic and/or Allergic reactions to the Embrace hydrogel manifested as immediate anaphylaxis or acute kidney injury (AKI - severe azotemia, oliguria and/or anuria) with no other apparent etiology; e.g., contrast sensitivity).	0	0.0% (0/106)
Freedom from Major Adverse Events for 30 Days Post-Index Procedure		
Lower Limit of One-sided 95% CI [4]	97.21%	
p-value [5]	<0.001	

[1] Full Analysis Population includes all enrolled subjects who were treated in the study and received the study intervention.
[2] Subjects that withdraw prior to completing the 30-day visit will not be included in the safety endpoint unless the subject experiences a safety endpoint event prior to withdrawal.
[3] Primary safety endpoint includes freedom from major adverse events (MAE) through 30 days post-index procedure as adjudicated by the CEC. MAEs were deemed by the CEC to be definitely device and/or procedure-related or probably device and/or procedure related and satisfies the severity criteria for a Grade = 3 event, classified in accordance with the 2017 Society for Interventional Radiology (SIR) Guidelines.
[4] One-sided 95% Clopper-Pearson exact confidence interval. The study device is considered to achieve the safety objective if the lower limit of the one-sided 95% CI is greater than the pre-specified performance goal of 80%.
[5] P-value is based on an exact binomial test comparing the proportion of subjects who are free from MAE to the performance goal of 80%. The hypothesis is evaluated at a one-sided 0.05 significance level.

Adverse events were coded using MedDRA, severity graded per NCI CTCAE Version 5.0 and in accordance with the 2017 SIR Adverse Event Severity Classification (i.e., mild, moderate, severe, life-threatening, disabling or death). Adverse events reviewed by CEC included: serious adverse events (SAEs) and/or potential clinical endpoint events (suspected rebleeds) to ensure proper identification and classification with respect to relationship to the study device and study procedure.

Among 130 treated subjects, 236 AEs were reported in 100 subjects (76.9%). There were no unanticipated adverse device effects adjudicated by the CEC as related to the use of Embrace HES. The majority of events were non-serious and mild or moderate in severity. Serious adverse events occurred in 58 subjects (44.6%). Overall, there were 43 events among 33 subjects (~25%) that were CEC-adjudicated as being associated with the index procedure (i.e., device and procedure related, device-related only, or procedure-related only). **Table 10** provides a summary of device and/or procedure related events for the full analysis population. The all-cause mortality rate at 30 days was 10.8% (14/130 subjects). No death was assigned an attribution of definitely or probably-related to the device and/or the procedure by the CEC. One death was considered possibly related (an event of renal hemorrhage).

Table 10 **Additional Safety Analysis All Adverse Events by Relationship Full Analysis Population**

	N=130	
	Number of Events N	**Number of Subjects with Events % (n/N)**
Total Number of Related AEs	43	25.4% (33/130)
Total Number of Device and Procedure Related AEs	21	13.8% (18/130)
Blood and lymphatic system disorders	2	1.5% (2/130)
Anemia	1	0.8% (1/130)
Splenic necrosis	1	0.8% (1/130)
Gastrointestinal disorders	6	4.6% (6/130)
Abdominal pain	4	3.1% (4/130)
Duodenal perforation	1	0.8% (1/130)
Nausea	1	0.8% (1/130)
General disorders and administration site conditions	1	0.8% (1/130)
Pyrexia	1	0.8% (1/130)
Hepatobiliary disorders	2	0.8% (1/130)
Hepatobiliary disease	2	0.8% (1/130)
Infections and infestations	1	0.8% (1/130)
Urinary tract infection	1	0.8% (1/130)
Injury, poisoning and procedural complications	3	2.3% (3/130)
Post embolization syndrome	1	0.8% (1/130)
Post procedural hemorrhage	2	1.5% (2/130)
Renal and urinary disorders	6	4.6% (6/130)
Acute kidney injury	6	4.6% (6/130)
Total Number of Device Related AEs	5	3.1% (4/130)
Injury, poisoning and procedural complications	2	1.5% (2/130)
Post procedural hemorrhage	2	1.5% (2/130)
Renal and urinary disorders	2	1.5% (2/130)
Renal hemorrhage	2	1.5% (2/130)

	N=130	
	Number of Events N	**Number of Subjects with Events % (n/N)**
Vascular disorders	1	0.8% (1/130)
Shock	1	0.8% (1/130)
Total Number of Procedure Related AEs	17	10.8% (14/130)
Gastrointestinal disorders	1	0.8% (1/130)
Constipation	1	0.8% (1/130)
General disorders and administration site conditions	2	1.5% (2/130)
Pyrexia	2	1.5% (2/130)
Injury, poisoning and procedural complications	3	2.3% (3/130)
Vascular pseudoaneurysm	3	2.3% (3/130)
Musculoskeletal and connective tissue disorders	3	2.3% (3/130)
Back pain	1	0.8% (1/130)
Groin pain	2	1.5% (2/130)
Renal and urinary disorders	4	3.1% (4/130)
Acute kidney injury	4	3.1% (4/130)
Reproductive system and breast disorders	1	0.8% (1/130)
Scrotal pain	1	0.8% (1/130)
Respiratory, thoracic and mediastinal disorders	1	0.8% (1/130)
Respiratory failure	1	0.8% (1/130)
Skin and subcutaneous tissue disorders	1	0.8% (1/130)
Ecchymosis	1	0.8% (1/130)
Vascular disorders	1	0.8% (1/130)
Shock hemorrhagic	1	0.8% (1/130)
Total Number of Pre-Embolic Related AEs [1]	2	1.5% (2/130)
Gastrointestinal disorders	1	0.8% (1/130)

	N=130	
	Number of Events N	**Number of Subjects with Events % (n/N)**
Duodenal perforation	1	0.8% (1/130)
Injury, poisoning and procedural complications	1	0.8% (1/130)
Post procedural hemorrhage	1	0.8% (1/130)
Total Number of Post-Embolic Related AEs [2]	2	1.5% (2/130)
Gastrointestinal disorders	1	0.8% (1/130)
Abdominal pain	1	0.8% (1/130)
Injury, poisoning and procedural complications	1	0.8% (1/130)
Post embolization syndrome	1	0.8% (1/130)

Serious Adverse Events (SAE)

SAEs categorized as either Device and Procedure Related, Device-Related or Procedure Related only are summarized in **Table 11**. Overall, there were 18 subjects who experienced at least one device and/or procedure related SAE as determined by the CEC. There were 11 device and procedure related SAEs, 3 device related SAEs, and 6 procedure related SAEs for a total of 20 events (1 subject experienced 2 device related SAEs).

Table 11. Summary of Serious Device and Procedure Related Events

	Number of Events N	**Number of Subjects with Events % (n/N)**
Total Number of Device and Procedure Related SAEs	11	8.5% (11/130)
Blood And Lymphatic System Disorders	1	0.8% (1/130)
Splenic Necrosis	1	0.8% (1/130)
Gastrointestinal Disorders	3	0.8% (1/130)
Abdominal Pain	2	1.5% (2/130)
Duodenal Perforation	1	0.8% (1/130)
General Disorders And Administration Site Conditions	1	0.8% (1/130)
Pyrexia	1	0.8% (1/130)
Injury, Poisoning And Procedural Complications	3	2.3% (3/130)
Post Embolization Syndrome	1	0.8% (1/130)

	Number of Events N	Number of Subjects with Events % (n/N)
Post Procedural Hemorrhage	2	1.5% (2/130)
Renal And Urinary Disorders	3	2.3% (3/130)
Acute Kidney Injury	3	2.3% (3/130)
Total Number of Device Related SAEs	3	1.5% (2/130)
Injury, Poisoning And Procedural Complications	1	0.8% (1/130)
Post Procedural Hemorrhage	1	0.8% (1/130)
Renal And Urinary Disorders	1	0.8% (1/130)
Renal Hemorrhage	1	0.8% (1/130)
Vascular Disorders	1	0.8% (1/130)
Shock	1	0.8% (1/130)
Total Number of Procedure Related SAEs	6	4.6% (6/130)
Injury, Poisoning And Procedural Complications	1	0.8% (1/130)
Vascular Pseudoaneurysm	1	0.8% (1/130)
Renal And Urinary Disorders	3	2.3% (3/130)
Acute Kidney Injury	3	2.3% (3/130)
Respiratory, Thoracic, And Mediastinal Disorders	1	0.8% (1/130)
Respiratory Failure	1	0.8% (1/130)
Vascular Disorders	1	0.8% (1/130)
Shock Hemorrhagic	1	0.8% (1/130)

The Embrace Hydrogel Embolic System (HES) was not evaluated for treatment of lower GI bleeds, arteriovenous malformations, arteriovenous shunts, endoleaks, penetrating trauma of extremities, and spinal arteries, and utilization of Embrace Hydrogel Embolic System (HES) for any of these applications or vascular territories may result in serious adverse events or injury.

2. Effectiveness Results

The primary effectiveness endpoint was the proportion of subjects who achieved Clinical Success, defined as the absence of bleeding from the target lesion after embolization with Embrace HES without the use of subsequent embolic devices during the index procedure and without emergency surgery, re-embolization, or other target-vessel re-interventions for rebleeding within 30 days. To be considered a Clinical Success, all target vessels treated with Embrace HES had to meet the criteria for Technical Success defined as occlusion of

the target vessel or exclusion of the area of arterial damage and/or the cessation of extravasation on angiography following Embrace HES administration. Technical success and target-vessel rebleeding was confirmed radiologically or endoscopically. Imaging obtained for diagnosing target vessel rebleeding were made available for review by the Imaging Core lab with final adjudication determined by the CEC. The Evaluable Population includes all subjects who were treated in the study, received the study intervention and were evaluable for the primary effectiveness endpoint (N=110). The primary effectiveness endpoint of Clinical Success was achieved in 90.0% of subjects (99/110). The two-sided 95% exact Clopper-Pearson confidence interval (95%CI) was 82.81% to 94.90%. The observed lower bound of the 95%CI exceeded the performance goal of 78.6%. The primary effectiveness endpoint was demonstrated using a one-sided Z-test with continuity correction ($Z = 3.75$; $p < 0.001$). See **Table 12**.

Among the 110 subjects in the evaluable population, 11 were classified as primary effectiveness endpoint failures (i.e., did not meet the criteria for Clinical Success). Of these, 7 subjects (6.4%) were classified as clinical failures due to the use of an ancillary embolic agent to achieve complete hemostasis, despite the procedures ultimately resulting in bleeding control. This pattern is consistent with routine clinical practice in the management of complex arterial bleeding, where adjunctive embolic use is commonly employed to optimize procedural outcomes. One subject (0.9%) had persistent bleeding at the conclusion of the index procedure and required surgical intervention. Three subjects (2.7%) experienced rebleeding requiring additional intervention within the 30-day follow-up period, indicating a low incidence of delayed or latent rebleeding events.

Table 12. Primary Effectiveness Endpoint

	N=110 [1]				
	Performance Goal	**Clinical Success [2]**	**95% Confidence Interval [3]**	**Z-statistic [4]**	**p-value [5]**
Primary Effectiveness Endpoint: Clinical Success [3]	78.6% [6]	90.0% (99/110)	(82.81% , 94.90%)	3.75	<0.001

[1] Evaluable Population includes all subjects who were treated in the study, received the study intervention and were evaluable for the primary effectiveness endpoint.
enrolled with uncorrectable coagulopathy prior to protocol rev D were included in the primary effectiveness endpoint if population crit eria were met.
[2] Clinical Success defined as the absence of bleeding from the target lesion after embolization with Embrace HES without the need for subsequent embolic devices in the index procedure, emergency surgery, re-embolization or other target vessel re-interventions due to rebleeding within 30 days of the index procedure.
[3] Two-sided 95% Clopper-Pearson exact confidence interval.
[4] The hypothesis will be tested using the Z-test similar to that discussed in Section 3 (titled A New Approach) in Lu et al. (2020), with a continuity correction, at a one-sided
0.025 level of significance. The null hypothesis will be rejected if Z exceeds the critical value of 1.96.
[5] P-value is based on Z-test comparing subjects clinical success goal of 65% UGI and 80% Non-UGI. The hypothesis is evaluated at a one-sided 0.025 significance level.
[6] Composite performance goal is the weighted average of the performance goals which follows the Lu method.

3. Sub-Group Analysis

Clinical success rates for the primary effectiveness endpoint were high in both male and female subjects and were consistent across gender groups (**Table 13**). In the overall evaluable population, clinical success was achieved in the majority of subjects regardless of gender. A logistic regression test for homogeneity including gender and bleeding type as independent variables did not identify a statistically significant gender effect on clinical success (p = 0.220). These results indicate that the effectiveness of Embrace HES was consistent across genders, with no evidence of differential treatment effect based on sex.

Table 13. Primary Effectiveness Endpoint by Gender

	Overall [1] N=110	**Test for Homogeneity p-value [3]**
Primary Effectiveness Endpoint: Clinical Success [2]		0.220
Male (n=70)	87.1% (61/70)	
Female (n=40)	95.0% (38/40)	

[1] Evaluable Population includes all subjects who were treated in the study, received the study intervention and were evaluable for the primary effectiveness endpoint.
[2] Clinical Success defined as the absence of bleeding from the target lesion after embolization with Embrace HES without the need for subsequent embolic devices in the index procedure, emergency surgery, re-embolization or other target vessel re-interventions due to rebleeding within 30 days of the index procedure.
[3] A test for homogeneity by assessing gender effect in a logistic regression model with gender as the nominal independent variable and the incidence of the effectiveness endpoint as the dependent variable. The p-value shown is for the gender term and is assessed at a 0.15 significance level. Lack of homogeneity will be declared if t he p-value for the gender effect exceeds 0.15.

4. Pediatric Extrapolation

In this premarket application, existing clinical data was not leveraged to support approval of a pediatric patient population.

XI. 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 clinical study for the hemorrhage control indication included 108 investigators of which 0 were full-time or part-time employees of the sponsor and 2 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: 2
- Significant payment of other sorts: 0, None

- Proprietary interest in the product tested held by the investigator: 0, None
- Significant equity interest held by investigator in sponsor of covered study: 2

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.

XII. PANEL MEETING RECOMMENDATION AND FDA'S POST-PANEL ACTION

In accordance with the provisions of section 515(c)(3) 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.

XIII. CONCLUSIONS DRAWN FROM PRECLINICAL AND CLINICAL STUDIES

A. Effectiveness Conclusions

Effectiveness of the device for the hemorrhage control indication was demonstrated based on data from non-clinical and pre-clinical testing leveraged from the original PMA P250003, as well as new nonclinical and pre-clinical testing and a prospective, multicenter, single-arm, staged study comparing results to performance goals (PGs) derived from published outcomes for standard-of-care embolic agents. The primary effectiveness endpoint was the proportion of subjects who achieved Clinical Success, defined as the absence of bleeding from the target lesion after embolization with Embrace HES without the use of subsequent embolic devices during the index procedure and without emergency surgery, re-embolization, or other target-vessel re-interventions for rebleeding within 30 days. The primary effectiveness endpoint of Clinical Success was achieved in 90.0% of subjects (99/110). The two-sided 95% exact Clopper-Pearson confidence interval was 82.81% to 94.90% The lower bound of the 95%CI exceeded the performance goal of 78.6%. The primary effectiveness endpoint was demonstrated using a one-sided Z-test with continuity correction ($Z = 3.75$; $p < 0.001$).

B. Safety Conclusions

The risks of the device are based on nonclinical and pre-clinical animal studies leveraged from the original PMA P250003, as well as new non-clinical testing and data collected in the clinical study conducted to support PMA approval as described above.

The safety of Embrace HES for hemorrhage control embolization was evaluated on the basis of freedom of major adverse events (MAE) compared with a literature derived performance goal (PG) of 80%. The primary safety endpoint was achieved in 100% of evaluable subjects (0/106 MAEs). No MAEs were reported, including no instances of non-target embolization, bowel ischemia, or toxic or allergic reactions attributable to the Embrace hydrogel. The lower bound of the one-sided 95% confidence interval for freedom from MAEs; i.e., 97.21%, exceeded the prespecified performance goal of 80%, and the

exact binomial test demonstrated statistical significance ($p < 0.001$). There were no unanticipated adverse device effects associated with the use of the Embrace HES.

C. Benefit-Risk Determination

The probable benefits of the device are based on data collected in the clinical study conducted to support PMA approval as described above. The data presented in this study demonstrate that embolization is a safe and effective therapeutic strategy to manage peripheral arterial bleeds and preventing the recurrence of bleeding through 30 days.

The probable risks of the device are also based on data collected in the clinical studies conducted to support PMA approval as described above. The use of the Embrace HES did not present any unknown risks that have not been previously described for transarterial embolization agents/devices. Adverse events reported in the course of the clinical study were not unexpected, neither in rate nor occurrence.

1. Patient Perspective

   This submission either did not include specific information on patient perspectives or the information did not serve as part of the basis of the decision to approve or deny the PMA for this device.

In conclusion, given the available information above, the data support that for embolization of peripheral arterial bleeds in vessels ≤6mm, the probable benefits outweigh the probable risks when used in accordance with device labeling.

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 findings from the studies support the use of Embrace HES as a safe and effective method for treating peripheral arterial bleeds when used in accordance with device labeling and the instructions for use (IFU).

XIV. CDRH DECISION

CDRH issued an approval order on 10/23/2026. The applicant's manufacturing facilities have been inspected and found to be in compliance with the device Quality System (QS) regulation (21 CFR 820).

XV. 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.

XVI. REFERENCES

1. Tert-Butyl Hydroperoxide. Annex XV Restriction Report by The National Institute of Public Health and Environment (RIVM) (2008). https://echa.europa.eu/documents/10162/17228/trd_netherlands_tbhp_en.pdf/58159ba9-42b6-4d43-a29c-c182b8216127.