INTELLECT 2-HF
INvesTigation to OptimizE Hemodynamic Management of HeartMate II™ Left VentricuLar Assist DEvice Patients using the CardioMEMS™ Pulmonary ArTery Pressure Sensor in Advanced Heart Failure (INTELLECT 2-HF)
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Clinical Investigation Plan (CIP)

Sponsor : Abbott
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1 INTRODUCTION

This document is a clinical investigation plan (CIP) for the INvesTigation to OptimizE Hemodynamic Management of HeartMate II™ Left VentricuLar Assist DEvice Patients using the CardioMEMS™ Pulmonary ArTery Pressure Sensor in Advanced Heart Failure (INTELLECT 2-HF) study. This observational post market study is intended to characterize hemodynamic-guided management of patients with an existing left ventricular assist device (LVAD) to protocol specified target ranges and its impact on functional status, quality of life, and readmissions. Data will be collected in patients with a HeartMate™ Left Ventricular Assist System (LVAS) and CardioMEMS HF system. Both devices are FDA approved and will be utilized on label. This clinical investigation is sponsored by Abbott. All parties involved in the conduct of the clinical investigation will be qualified by education, training, and experience to perform their tasks and this training will be documented appropriately.

2 BACKGROUND AND JUSTIFICATION FOR CLINICAL INVESTIGATION

Heart failure (HF) is a progressive condition which affects the heart's ability to pump blood to the body's tissues and organs. Symptoms of HF include fluid retention, dyspnea, and exercise intolerance. When patients advance to NYHA class IIIA and are hospitalized, the CardioMEMS™ HF system is indicated for wireless PA pressure monitoring to guide HF management[1]. As the disease progresses to NYHA class IIIB, the HeartMate LVAD becomes an important treatment option for patients ineligible for cardiac transplant or those awaiting transplant. The pump is implanted in parallel with the native heart and is intended to provide long-term hemodynamic support[2, 3]. HeartMate use in advanced HF patients results in increased survival, quality of life, and functional status[2-4].

The majority of patients respond well clinically to LVAD support and improve to NYHA class I or II. However, approximately 20% of LVAD patients continue to experience poor functional status with NYHA class III or IV symptoms[4]. LVAD patients with worsening HF or impaired pump performance due to suboptimal hemodynamics are often re-hospitalized. In the ROADMAP study, about 80% of LVAD patients were re-hospitalized within a year after implant, and 10% of readmissions were due to pressure/volume management or worsening HF[5].

Improved hemodynamic monitoring of LVAD patients may reduce the readmission burden due to HF and volume management. CardioMEMS is an implantable wireless pressure sensor proven to reduce hospital admissions in NYHA class III patients. In the CHAMPION trial, CardioMEMS provided daily monitoring of PA pressure to optimize drug therapy in HF patients, resulting in a 37% reduction of HF related hospitalizations[1]. In addition to reduced readmission rates, HF management with CardioMEMS leads to improved quality of life, NYHA class, and six-minute walk distance[1, 6]. In LVAD patients, remote monitoring with CardioMEMS should allow physicians to intervene earlier when hemodynamic deterioration occurs. Appropriate medication or pump speed changes can be made to optimize pulmonary artery pressure and indirectly left ventricular filling pressure which may reduce HF hospital readmissions[7]. Frequent hemodynamic optimization may lead to improved functional status and quality of life, especially for patients who are failing to respond well to LVAD therapy.

Currently, there is limited data from patients with both a CardioMEMS device and LVAD. The purpose of this post market study is to characterize and evaluate hemodynamic-guided management in patients that have per indications received a HeartMate LVAD and a CardioMEMS HF System. Patients will be managed with the goal of achieving a PA diastolic pressure in a target range of 8 to 15 mmHg. This range is slightly higher than the PA diastolic pressure range found in healthy subjects (4 to 12 mmHg)[8] and allows for volume and pressure changes during the course of the day and avoid hypovolemia. The learnings from this feasibility

study will be used to develop CardioMEMS-guided treatment strategies to improve clinical outcomes of HeartMate patients with poor functional status and provide meaningful evidence for designing future studies.

3 DEVICE(S) UNDER INVESTIGATION

3.1 IDENTIFICATION AND DESCRIPTION OF THE DEVICES UNDER STUDY

3.1.1 Identification

3.1.1.1 The CardioMEMS™ Heart Failure (HF) System

The CardioMEMS HF System provides pulmonary artery (PA) hemodynamic data used for the monitoring and management of heart failure (HF) patients. The system measures PA pressure which physicians use to initiate or modify heart failure treatment.

The CardioMEMS HF System received CE Mark in 2011 and the current certificate was issued by British Standard Institute (BSI) on May 1, 2014. The system received Food and Drug Administration (FDA) approval on May 28, 2014 for commercial use in the United States. The CardioMEMS HF System is currently indicated for wirelessly measuring and monitoring pulmonary artery (PA) pressure and heart rate in New York Heart Association (NYHA) Class III heart failure patients who have been hospitalized for heart failure in the previous year. The hemodynamic data are used by physicians for heart failure management with the goal of reducing heart failure hospitalizations.

3.1.1.2 The HeartMate™ Left Ventricular Assist System (LVAS)

The HeartMate II LVAS is a set of equipment and materials that together comprise a medical device designed to provide therapeutic benefit to those afflicted with advanced heart failure. In service, the LVAS assumes some or all of the workload of the left ventricle, thereby restoring the patient's systemic perfusion while palliating the underlying pathology. The HeartMate II LVAS received FDA approval on January 20, 2010 and CE Mark approval in November, 2005. The FDA approved HeartMate II™ to provide hemodynamic support in patients with advanced refractory left ventricular heart failure; either for bridge to cardiac transplantation (BTT) or destination therapy (DT).

Table 1 – Identification of Devices under Investigation

Device name	Model/ Part Number	Manufacturer	Region/ Country	Investigational or Market Released
CardioMEMS™ PA Sensor and Delivery Catheter	CM2000	Abbott (formerly St. Jude Medical)	United States	Market Released
CardioMEMS™ Patient Electronics System	CMEMS1000, 1010 or 1100	Abbott	United States	Market Released
CardioMEMS™ Hospital Electronics System	CM3000	Abbott	United States	Market Released
HeartMate II™ LVAS	106015	Abbott	United States.	Market Released
HeartMate 3™ LVAS	106524	Abbott	United States	Upon Market Release indication

HeartMate 3™ is a next generation LVAS currently under investigation in the United States in the MOMENTUM 3 Investigational Device Exemption (IDE) clinical trial and Continued Access Protocol (CAP). The HeartMate 3™ LVAS is intended to provide hemodynamic support in patients with advanced refractory left ventricular heart failure; either for short term support, such as a bridge to cardiac transplantation (BTT) or myocardial recovery, or as long

term support, such as destination therapy (DT). FDA approval for short term support was received in August 2017. Patients with a HeartMate 3 implant can be considered for enrollment into INTELLECT 2 if they meet one of the following criteria:

- Patients with a commercial HeartMate 3 implant
- Short-term support patients such as BTT patients participating in the MOMENTUM 3 CAP
- BTT patients who have completed two year follow-up in the MOMENTUM 3 IDE trial
- Once FDA approval is granted for long-term support, long-term support patients such as DT patients from MOMENTUM 3 CAP or DT patients with complete two year follow-up from MOMENTUM 3 IDE are allowed to be enrolled

3.1.2 Device Description and Intended Purpose

The market approved devices to be used in this study are listed in the Table 1 above. All devices are commercially approved and market released and will be used per the approved labeling, Instructions for Use and Indications. For details regarding the instructions for use, training, storage and handling, preparation for use, precautions, intended populations, and indications for each product, please see the specific user's manual. For CardioMEMS™, the manuals are located at http://manuals.sjm.com and for HeartMate™, manuals can be found at http://www.thoratec.com/medical-professionals/resource-library/index.aspx.

3.1.3 Intended Purpose within the Clinical Investigation

This clinical investigation is an observational study intended to characterize the use of the CardioMEMS HF hemodynamic monitoring system in patients with an existing HeartMate LVAS. This study will help develop clinical strategies for managing LVAD patients with the use of a hemodynamic monitor and will inform the design of more definitive studies in this patient population.

4 CLINICAL INVESTIGATION DESIGN

4.1 Clinical Investigation Design

The INTELLECT 2-HF Study is a prospective, non-randomized multicenter, single-arm observational study, which will be conducted at up to 25 U.S. centers, and will enroll up to 100 subjects.

The expected duration of enrollment is approximately 18 months with a six month follow-up period. Patients will exit the study when they complete their six month follow-up visit. The total duration of the clinical investigation is expected to be approximately two years.

Patients will be managed with the goal of achieving a PA diastolic pressure in a target range between 8 and 15 mmHg. Clinician discretion is allowed on how to reach this target range by remotely adjusting diuretic/ vasodilator therapy, or by changing pump speeds at clinic visits. The change implemented, and reason for the change, must be documented in the CRF. If no change is made when the patient is outside the target range, the clinician must document the clinical rationale for not making a change. It is recommended that adjustments to diuretic medications be the first approach unless an alternate approach is clinically more appropriate. Pump speed changes in these patients are expected to be infrequent.

4.2 Objectives

INTELLECT 2 will gather data from patients with both the CardioMEMS™ HF System and HeartMate™ LVAD. Both devices are commercially approved and will be used, as indicated, per the labeling. The objective of this clinical investigation is to understand the role of hemodynamic monitoring in LVAD patients and:

- Characterize PA pressure measurements with the CardioMEMS HF System in LVAD patients under different clinical and physiologic conditions
- Characterize the effects of PA pressure on functional status, quality of life, and hospital readmissions of LVAD patients
- Evaluate target ranges for PA pressure and assess the impact of medication and pump speed changes on PA pressures

The results from this study will facilitate the design of future studies in this patient population, leading to the development of clinical strategies for managing LVAD patients using information from an implantable hemodynamic monitor.

4.3 ENDPOINTS

There are ten descriptive endpoints in this clinical investigation.

4.3.1 Descriptive Endpoints

1. Change in Six Minute Hall Walk (6MHW) distance from enrollment to six months
2. Changes in CardioMEMS PA pressure over time
3. Percentage of days PA pressure is in the pre-specified target range
4. Changes in PA pressure before 6MHW test to after 6MHW test
5. Device malfunction (e.g. loss of performance in either device)
6. NYHA classification at baseline and each scheduled follow-up visit
7. Health related quality of life (EQ-5D-5L)
8. All-cause hospitalization rate
9. Heart failure hospitalization rate including emergency department visits, or unscheduled clinic visits for worsening HF, volume management, and/or cardiovascular medication management
10. Change in 6MHWD, NYHA class, health related quality of life, or unscheduled hospitalizations by PA pressure

4.3.2 Additional Descriptive Data Analyses

1. CardioMEMS PA pressure data during LVAD speed ramp test, when done as standard of care
2. CardioMEMS PA pressure data during collection of right heart catheterization (RHC) data, when done as standard of care
3. LVAD speed, power, and estimated flow parameters
4. Heart Failure medications (counts and Total Daily Dosage (TDD))

4.4 STUDY POPULATION

The intended population for this clinical investigation is comprised of advanced heart failure patients over the age of 18 years who have a CardioMEMS device and a HeartMate LVAD.

4.4.1 Inclusion Criteria

To participate in this clinical investigation, the subject must meet all of the following inclusion criteria:

1. Subject has CardioMEMS HF PA Sensor and a commercially-approved HeartMate LVAD (Group A)

OR

Subject has commercially-approved HeartMate LVAD is experiencing NYHA class III symptoms, and has had a previous HF hospitalization and meets FDA indications for CardioMEMS. The CardioMEMS sensor must be implanted within 72 hours of consent (Group B)

2. Signed an informed consent form and agreed to provide access to patient and device data (including CardioMEMS Merlin.net data)
3. No connectivity or transmission problems with CardioMEMS
4. On HeartMate LVAD support for at least 3 months
5. Age ≥ 18 years

4.4.2 Exclusion Criteria

Subjects who meet any of the following exclusion criteria must be excluded from the clinical investigation:

1. Current participation in an investigation that is likely to confound study results or affect study outcome
2. Current participation in the MOMENTUM3 IDE clinical trial and has not completed the two year follow-up for that trial
3. Inability to perform 6MHW test due to conditions other than heart failure (e.g. severe arthritis, orthopedic issues, amputation etc.)

5 PROCEDURES

This clinical investigation will be conducted in accordance with this CIP. All parties involved in the conduct of this clinical investigation will be qualified by education, training, or experience to perform their tasks and this training will be documented appropriately.

This clinical investigation will not commence until the Sponsor receives written approval from the Institutional Review Board (IRB) and all required documents have been collected from the investigational site(s). All study staff will be required to undergo training prior to performing any study related activities. Approval from the Sponsor must be received and patients must sign written informed consent prior to initiating study procedures.

The following sections provide a detailed description of procedures required by this CIP.

5.1 Patient Recruitment

Patients will be recruited for the study by reviewing the device database for HeartMate LVAS patients with CardioMEMS devices for appropriateness for inclusion. Due to the narrow inclusion criteria requiring two specific devices, no additional steps will be taken to recruit under represented populations.

5.2 Informed Consent Process

The Principal Investigator or his/her authorized designee will conduct the Informed Consent Process, as required by applicable regulations and the center's IRB. Patients from Group A will provide consent for the sponsor to access CardioMEMS historical data collected prior to study enrollment as well as current data from the Merlin.net website. Group B will provide consent to review all data collected in the study. The CardioMEMS sensor must be implanted within 72 hours of consent.

This informed consent process will include a verbal discussion with the subject on all aspects of the clinical investigation that are relevant to the subject's decision to participate, such as details of clinical investigation procedures, anticipated benefits, and potential risks of clinical investigation

participation. During the discussion, the Principal Investigator or his/her authorized designee will avoid any improper influence on the subject and will respect the subject's legal rights. The subject shall be provided with the informed consent form written in a language that is understandable to the subject and has been approved by the center's IRB. The subject shall have adequate time to review, ask questions and consider participation.

If the subject agrees to participate, the Informed Consent form must be signed and dated by the subject and by the person obtaining the consent. The signed original will be filed in the subject's hospital or research charts, and a copy will be provided to the subject.

Failure to obtain informed consent from a subject prior to clinical investigation enrollment should be reported to Sponsor within 5 working days and to the reviewing center's IRB according to the IRB's reporting requirements.

During the clinical investigation, when new information becomes available that can significantly affect a subject's future health and medical care, the Principal Investigator or his/her authorized designee, will provide this information to the subject. If relevant, the subject will be asked to confirm their continuing informed consent in writing.

5.3 SCREENING

If it is institutional practice to allow pre-screening of charts for consideration in clinical trials, sites will follow institutional policies. Ideally identification of potential patients should be done during the startup process. After IRB approval and activation, potential patients presenting at the investigational sites will be fully informed about the clinical investigation, following the established Informed Consent Process (described in section 5.2). Once a duly dated and signed ICF is obtained, the screening procedures may begin.

If a subject does not meet all inclusion criteria or meets any of the exclusion criteria, or if a subject is not implanted with both the CardioMEMS HF System or the HeartMate LVAS, the subject will not be included in the study.

5.4 POINT OF ENROLLMENT

For Group A, the subject is considered enrolled (and will count toward the analysis,) when the subject has provided written Informed Consent, has been confirmed to meet all inclusion criteria and none of the exclusion criteria. For Group B, the subject is considered enrolled (and will count toward the analysis,) when the subject has provided written Informed Consent, has been confirmed to meet all inclusion criteria and none of the exclusion criteria and has been successfully implanted with CardioMEMS. Patients who do not have a successful CardioMEMS implant after consent, will not be considered enrolled.

The Principal Investigator or delegated study personnel will record enrollment information (name of the clinical investigation, date of consent and Inclusion/exclusion information) in the patient records and complete and submit applicable case report forms (CRF) in a timely manner, but not greater than 10 days from the study visit.

Notification of enrollment to the Sponsor is considered to have occurred when the Sponsor has received the applicable CRF. For Group B, the component information CRF will be completed upon successful implant and submitted to the sponsor.

5.5 SCHEDULED PROCEDURES

The Principal Investigator is responsible for ensuring all clinical investigation data is collected as required per CIP scheduled procedures.

5.5.1 Baseline

The following baseline assessments and information will be collected after informed consent is obtained at the baseline visit. For Group A patients, these assessments will be done after consent. For Group B patients, assessments will be performed after consent and within 3 days prior to the CardioMEMS™ HF System implant.

- Medical history, physical and documentation of Inclusion/ exclusion information,
- Heart failure visit assessment including assessing and recording NYHA class, height, weight and vital signs
- Documentation of demographic information
- Documentation of HeartMate device model and CardioMEMS™ study device sensor serial number information (for group B this CRF will be completed after successful CardioMEMS implant)
- Current Medications: anticoagulation/anti platelet, and cardiovascular medications including ACE inhibitors, ARBs, beta blockers, nitrates, hydralazine, aldosterone antagonists, digoxin and diuretics. Other medications do not need to be tracked.
- Documentation of current pump parameters
- Administer Six Minute Hall Walk test (6MHWT). For Group A, CardioMEMS PA reading taken before 6MHW test (at rest) and immediately following 6MHW test (see Appendix D), ideally within one minute of test
- Administer EQ-5D-5L survey

5.5.2 Scheduled Follow-ups

Follow-up schedules are calculated from the time of baseline. Follow-up visits are scheduled at Months 1, 3, and 6 post study enrollment (two devices implanted). Sponsor Representatives will be involved in providing technical support during the Follow-up procedures.

At each visit, the following procedures must be completed:

- Document all changes in cardiovascular medications: ACE inhibitors, ARBs, beta blockers, nitrates, aldosterone antagonists, digoxin and diuretics
- Record vital signs
- NYHA Classification
- Administer EQ 5D 5L survey
- Review and document changes in pump parameters
- Administer 6MHW test per Appendix D
- CardioMEMS PA readings taken before (at rest) 6MHW test and immediately following 6MHW test, ideally within one minute of test completion (Group A and Group B)
- Emergency room visits, hospitalizations and cause for hospitalization documented
- Occurrence of protocol defined AEs (date of adverse event, determination of the seriousness and/or relation to the device, resolution of the adverse event)
- Reoperations/operative procedures pertaining to the two devices under study (HeartMate and, CardioMEMS)
- Pump Replacements/Explants/Device Exchanges (note patients are required to be withdrawn from the study at the time either device is removed)

5.6 Hemodynamically Guided Clinical Management

The CardioMEMS HF System allows intermittent assessment of pulmonary artery systolic, diastolic and mean pulmonary artery pressures. Pulmonary artery pressure data from the CMEMS system, in conjunction with symptoms, weight and physical exam will be used to guide

clinical management of subjects following the initial CardioMEMS implant and throughout the 6-month follow-up period after enrollment.

Pulmonary artery diastolic pressure will be targeted and maintained between 8 and 15 mmHg through heart failure medical management (primarily with diuretics, nitrates, titration of HF medications), blood pressure control or LVAD speed adjustments. It is anticipated that medications can be adjusted remotely based on PA pressures observed on Merlin.net. LVAD speed adjustments are expected to be infrequent and must be done in the clinical setting. Pressure data from the CardioMEMS system will be reviewed and monitored by the clinician as frequently as is clinically indicated, but at a minimum weekly. LVAD speed changes and adjustments to HF medications will be logged throughout the follow-up period, along with the reason for the adjustment. Additionally, failure to maintain the patient in the targeted range of between 8-15 mmHg will be documented along with the reason for nonconformance.

5.6.1 Merlin.net

The Investigator or designee will review the PA pressure measurements transmitted from the home monitoring unit to Merlin.net via the Merlin.net portal. Pressure thresholds will be set to between 8 and 15 mmHg, and notifications can be set to alert the physician if pressures fall out of these ranges. These threshold notifications are intended to guide the Investigator to review the Merlin.net website and, if clinically appropriate, make a change. The Investigator or designee will review the PA pressure measurements on a weekly basis at a minimum and appropriately utilize the information to assist in the clinical management of subjects. Logins to the database will be monitored by the sponsor. Reminders will be sent to the clinical sites if no appropriate logins are observed. Clinical and technical support from the sponsor will be available to the Investigator as needed. Patients from Group A will provide consent for the sponsor to access CardioMEMS historical data collected prior to study enrollment as well as current data from the Merlin.net website. Group B will provide consent to review all Merlin.net data collected in the study.

5.7 PATIENT REPORTED OUTCOME (PRO) MEASURES

The Study Coordinator or designee will administer patient-reported outcome questionnaires. It is important the subject understands the meaning of all words and instructions in the questionnaires. The subject should be instructed to ask any questions about the questionnaires if further explanation is needed. The subject should be provided with the questionnaire as the first activity upon arrival and prior to any clinical interviewing. Once the questionnaires are completed, the Study Coordinator or designee will review for completeness to verify that all questions have been answered according to the directions provided.

The following PRO measures will be collected according to the study requirements.

5.7.1 EQ-5D-5L Questionnaire

The EQ-5D-5L Questionnaire is a standardized measure of health status developed by the EuroQol Group in order to provide a simple, generic measure of health for clinical and economic appraisal. The self-administered/electronic questionnaire consists of questions relating to mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension has 5 levels: no problems, slight problems, moderate problems, severe problems, and extreme problems. The subject is asked to indicate his/her health state by ticking (or placing a cross) in a box next to the most appropriate statement in each of the 5 dimensions and the visual analogue score. The data collected will be transferred into the Remote Data Capture (RDC) application by the coordinator and the original questionnaire kept as source. The questionnaire takes approximately five minutes to complete.

5.8 UNSCHEDULED VISITS

5.8.1 Unscheduled Office Visits

The site is required to report any associated reportable adverse events as detailed in section 8.2, as well as documentation of any medication or pump changes, and the reason for such changes, on the Heart Failure Medication Log and Pump Parameter Log CRF.

5.8.2 Emergency Room Visits or Outpatient Short Stays

All emergency room or short stays (<24 hours) visits related to heart failure will be documented and reported. Visit details must be reported to the Sponsor through the Hospitalization CRF and AE CRF through the electronic data capture system upon discovery of the event.

5.8.3 Hospitalizations

All hospitalizations with the associated reasons will be captured as sites become aware and will be reviewed during the follow-up visit. While hospitalized, the follow-up visit assessments will continue to be performed according to the follow-up schedule. Hospitalizations must be reported to the Sponsor through the EDC system upon discovery of the event or, at the latest, if the hospitalization is unknown to the implanting site (i.e. at another facility), during the next follow-up visit.

5.8.4 Right Heart Catheterization

CardioMEMS readings will be taken along with standard hemodynamic measurements collected any time a right heart catheterization (RHC) procedure is done as standard of care. See RHC data collection instruction on RHC CRF. Following sensor implant, subsequent RHC procedures or pulmonary artery catheter insertions must be performed under fluoroscopic guidance to avoid sensor dislodgement.

Resetting of the sensor baseline will be performed as deemed necessary by the investigator or the Sponsor. Baseline resetting may require an echocardiogram or a RHC procedure. Following the sensor implant, should a RHC procedure or PA catheter evaluation be clinically warranted, comparative pulmonary artery pressures utilizing the CardioMEMS HF System should also be obtained utilizing the hospital electronics unit.

5.8.5 Subject Home PA Pressure Readings

Following the sensor implant procedure, the Patient System Guide will be followed and subjects will be instructed on how to take their own pulmonary artery pressure measurements, utilizing the CardioMEMS HF System per standard of care. Patients can refer to the Patient System Guide for detailed information.

5.8.6 PA Pressure Readings in the Hospital

If a subject is hospitalized, seen in the emergency room (ER) or has a clinic visit, the CardioMEMS™ HF System may be used to obtain pulmonary artery pressure measurements at the investigator's discretion.

5.9 RAMP STUDIES

When any ramp studies are performed per institutional protocol, PA pressure data will also be collected with the CardioMEMS™ system with each change in pump speed.

5.10 STUDY FLOW CHART

A Study Flow Chart (Figure 1) and list of tests performed and assessments at each follow-up visit (Table 2) summarizes the requirements of this clinical investigation.

Figure 1 – Study Flow Chart

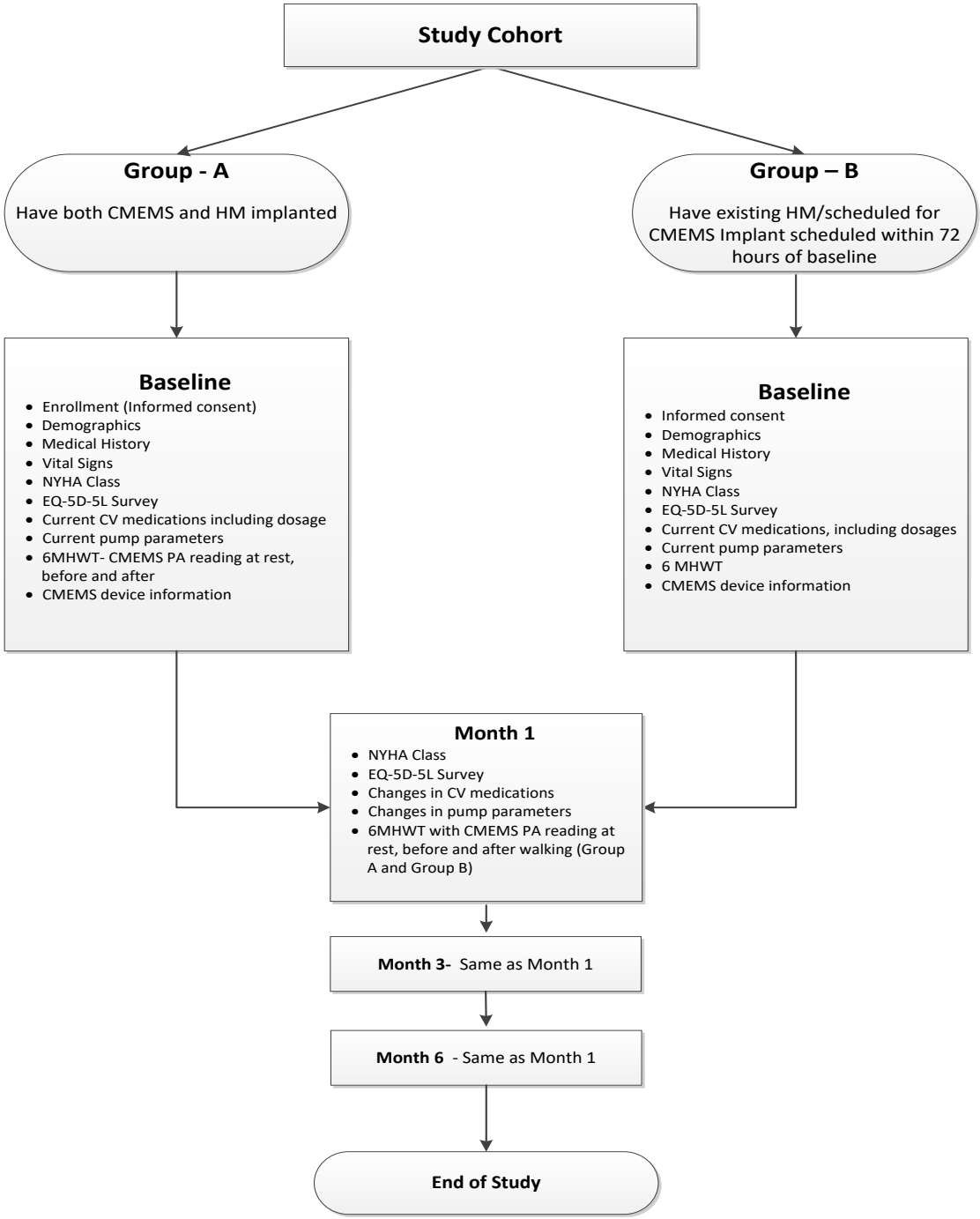

Table 2 – List of All Clinical Investigation Specific Tests and Procedures

	Visit				
Study Activity	Enrollment & Baseline + 3 days	1 Month (30 ±7 days window)	3 Month (90 ±7 days window)	6 Month (180 ±30 days window)	As occurs
Informed Consent Process, cardiovascular history and inclusion review	X				
Demographics	X				
Heart failure exam including vital signs	X	X	X	X	
Medical history	X				
Review cardiovascular medications, including dosages	X	X	X	X	x
LVAD pump parameters	X	X	X	X	x
CardioMEMS and LVAD device information	X				
CardioMEMS reading pre and post six minute walk test	X*	X	X	X	
EQ-5D-5L	X	X	X	X	
NYHA Class	X	X	X	X	
6 minute walk test	X	X	X	X	
Changes in CV medications					(X)
Adverse event, hospitalization and device malfunction					(X)
Deviation or withdrawal					(X)
CardioMEMS measurements during RHC					(X)
CardioMEMS measurements during RAMP testing					(X)

(as indicated)

* For Group A Only

Note: Medications logs and pump changes are to be updated when changes occur

5.11 DESCRIPTION OF ACTIVITIES PERFORMED BY SPONSOR REPRESENTATIVES

Trained Sponsor personnel may provide technical expertise and technical guidance on the use of the CardioMEMS™ HF System and HeartMate™ LVAS, including study training, technical training and will be available to respond to queries.

While Sponsor representatives may assist with these activities, the Principal Investigator remains responsible for ensuring all clinical investigation data is collected as required per CIP.

5.12 SUBJECT STUDY COMPLETION

Subject participation in the clinical investigation will conclude upon completion of the 6-month visit.

5.13 SUBJECT WITHDRAWAL

Subjects must be informed about their right to withdraw from the clinical investigation at any time and for any reason without sanction, penalty or loss of benefits to which the subject is otherwise entitled. Withdrawal from the clinical investigation will not jeopardize their future medical care or relationship with the investigator. Subjects will be requested to specify the reason for the request to withdraw. The investigator must make all reasonable efforts to retain the subject in the clinical investigation until completion of the clinical investigation.

If a subject at any time prior to the six month visit, has either the CardioMEMS™ or HeartMate™ device explanted, once the AE is captured, the patient should be withdrawn since they can no longer contribute meaningful study data. The reason for explant will be documented.

A subject will be considered 'Lost to Follow-up' after two missed visits and a minimum of two unsuccessful phone calls from investigational site personnel to the subject or contact to schedule the next follow-up visit. These two phone calls must be documented in the subject's hospital records. If the subject is deemed lost to follow-up a letter should be sent to the subject's last known address or to the subject's general practitioner (GP) and a copy of the letter must be maintained in the subject's hospital records.

When subject withdrawal from the clinical investigation is due to an adverse event, the subject will be followed until resolution of that adverse event or determination that the subject's condition is stable. The status of the subject's condition should be documented at the time of withdrawal.

In case of subject withdrawal, the site should make attempts to schedule the subject for a final study visit. At this final study visit, the subject will undergo assessments scheduled for the follow up visit subject is closest to.

5.14 STUDY COMMITTEES

5.14.1 Steering Committee (SC)

A Steering Committee has been formed and has advised the Sponsor on key aspects related to the development, execution, analysis and reporting, and overall conduct of the clinical investigation.

5.14.2 Publication Committee (PC)

A Publication Committee shall be established to oversee study publications. Publication Committee membership may include members of the Steering Committee, a representative of Abbott and a statistician. The Publication Committee will be responsible for identifying, selecting and approving publication proposals and determining authorship according to a Publication Plan.

A Publication Committee charter will define membership of the committee and outline the roles and responsibilities of the committee, as well as rules to define authorship.

6 DATA ANALYSIS CONSIDERATIONS

This is a feasibility study evaluating commerciallyapproved devices and has only descriptive endpoints. These endpoints will be evaluated via descriptive summary statistics without formal tests of hypothesis. The goal of this study is to gather data from subjects with both the CardioMEMS™ HF System and an FDA-approved HeartMate II™ (and HeartMate 3™ upon FDA approval) Left Ventricular Assist Device (LVAD). Both devices are commercially approved and will be used, as indicated, per the labeling. The underlying belief is that maintaining pulmonary artery pressure within a target range using CardioMEMS hemodynamic monitoring will improve outcomes in HeartMate LVAD patients.

Statistical analyses will be conducted to understand the role of hemodynamic monitoring in LVAD patients in order to:

- Characterize PA pressure measurements with the CardioMEMS HF System in LVAD patients under different clinical and physiologic conditions

  To characterize PA pressure in LVAD patients, descriptive statistics will be used to quantify pressure at baseline, throughout the study and at 6 months using available data throughout the study. Raw PA pressures will be analyzed similarly at 1, 3, and 6 months. To characterize the impact of physical activity on PA pressure, descriptive statistics will be used to quantify the change in PA pressure before and after the 6MHW test.

- Characterize the effects of PA pressure on functional status, quality of life, and hospital readmissions of LVAD patients

  To characterize the effects of PA pressure on clinical outcomes, patients will also be divided into subgroups based on time spent in the target PA pressure range and overall change in PA pressure during the follow-up period. Hospital readmissions and changes in functional status and quality of life will be quantified in these subgroups. The results can be used to find potential pressure ranges that are achievable in LVAD patients and have good clinical outcomes.

- Evaluate target ranges for PA pressure and assess the impact of medication and pump speed changes on PA pressures

  The percentage of days that PA pressure is in the target range at different points in the study will be used to assess the impact of medication and pump speed changes on PA pressures.

The results of this study will be used to design future clinical trials. Any statistical significance levels (p-values) obtained from the statistical tests will be used to help identify endpoints that are sensitive to the potential benefits achieved from utilizing the CardioMEMS HF System to monitor and treat LVAD patients. Note that Group A and B patients will be analyzed together as one group and also as separate groups.

6.1 ANALYSIS OF ENDPOINTS

6.1.1 Descriptive Endpoints

The following endpoints will be analyzed using descriptive statistics. Continuous variables will be summarized using numbers of subjects, mean, standard deviation, median, minimum, and maximum. Categorical variables will be summarized using frequency and percentages. Rate data will be summarized using events per patient-time.

1. Change in Six Minute Hall Walk (6MHW) distance will be summarized as change from baseline and using raw values, at 1, 3, and 6 months.

2. Changes in CardioMEMS™ PA pressure over time will include PA systolic, diastolic and mean pressures; heart rate; and cardiac output (calculated using latest algorithm for CardioMEMs) and will be summarized at baseline, throughout the study, and at 6 months.

3. Percentage of days over 6 months that PA diastolic pressure is between 8 and 15 mmHg will be summarized using the total number of days that pressures were measured as the denominator. The percentage will also be calculated at different points during the study. This endpoint will be used to assess the impact of medication and pump speed changes on PA pressures.

4. Changes in PA pressure before the 6MHW test to after the 6MHW test will be summarized at baseline (Group A only) and at 1, 3, and 6 months for both groups.

5. Device malfunction will include all instances of loss of performance of either device and will be summarized separately by device and type of loss of performance at 1, 3, and 6 months.

6. NYHA classification will be analyzed as a categorical variable and as a continuous variable at baseline, 1, 3, and 6 months. Change from baseline in NYHA will be analyzed similarly.

7. Health related quality of life (EQ-5D-5L) total score and visual analogue scale will be scored using the recommended scoring algorithms and analyzed at baseline, 1, 3, and 6 months. The change from baseline in EQ5D-5L will be analyzed similarly.

8. All-cause hospitalization rate will be summarized over 6 months in units of events per patient-time.

9. Heart failure hospitalization rate including emergency department visits, or unscheduled clinic visits for worsening HF, volume management, and/or cardiovascular medication management will be summarized over 6 months in units of events per patient-time.

10. Change in 6MHWD, NYHA class, EQ-5D-5L, or unscheduled hospitalizations will be analyzed descriptively according to subgroups based on PA diastolic pressure.

6.1.2 Additional Descriptive Data Analyses

1. CardioMEMS™ PA pressure data during LVAD speed ramp test, when done as standard of care, will be summarized over 6 months.

2. CardioMEMS PA pressure data during collection of right heart catheterization (RHC) data, when done as standard of care, will be summarized over 6 months.

3. LVAD speed, power, and estimated flow parameters will be summarized over 6 months.

4. Heart Failure medications will be summarized as both counts and total daily dosage according to class of medication at baseline 1, 3, and 6 months.

6.1.3 Adverse Events

All protocol-required adverse events (AE) will be summarized by type of AE (non-serious AE, serious AE, non-serious device-related AE and serious device-related AE) at 1, 3, and 6 months.

6.2 Overall Sample Size

The sample size of 100 subjects is expected to provide enough data to address each of objectives stated above. This study will inform the design of future clinical studies.

6.3 Timing of Analysis

Analyses will be performed when the last patient enrolled completes 6 months of follow-up in the study.

6.4 Success Criteria

As a feasibility study, there are no pre-specified statistical criteria for success.

6.5 Interim Analysis

Interim analyses will be conducted as data accumulates in this study. As there are no hypotheses to be tested, type I error control is not applicable.

6.6 Statistical Criteria for Termination

There are no statistical criteria for termination of this trial.

7 RISKS AND BENEFITS

It is not anticipated that patients would experience any new risks not identified in the User Manual for either the CardioMEMS sensor and the HeartMate LVAS. There are some minor possible risks to the protocol and are listed below. The additional tests and assessments required by the clinical investigation were analyzed for additional risks and are incorporated in the sections below.

7.1 Risks Associated with Clinical Investigation Assessments

The risks for the CardioMEMS™ device are known and are detailed in the user manuals. No additional risks are known that involve participation in the clinical investigation. If new risks are learned during the course of the study, sites will be notified.

7.2 Risk Control Measures

Every possible effort will be taken to minimize the risks, including:

- Careful selection of experienced Investigators for the clinical investigation
- Adequate monitoring for each clinical investigation site
- Conducting the clinical investigation in accordance with the CIP, all applicable laws and regulations and any conditions of approval imposed by the appropriate IRB/EC or applicable regulatory authorities where the clinical investigation is performed
- Use of the HeartMate and CardioMEMS devices and performance will be in accordance with the device IFUs
- Training of Investigators on the CIP

7.3 ANTICIPATED BENEFITS

The combined use of HeartMate with CardioMEMS has the potential benefit of improving management of HeartMate patients, improving functional status and reducing adverse events and hospitalizations.

7.4 RISK-TO-BENEFIT RATIONALE

The patients enrolled in this study will already have market approved devices implanted on indication for the management of heart failure. Clinicians will be expected to manage the patients per standard of care while data is collected. While no benefit may be found, it is possible that patients will experience reduction in symptoms leading to reduction in frequency of hospitalization for heart failure. This feasibility study is intended to provide data that will be used to inform the design of future clinical studies to answer the question of combined benefit. As such, the benefit outweighs risks supporting the feasibility study.

8 REQUIREMENTS FOR INVESTIGATOR RECORDS AND REPORTS

8.1 DEVIATIONS FROM CIP

A deviation is defined as an instance(s) of failure to follow, intentionally or unintentionally, the requirements of the CIP. The investigator should not deviate from the CIP.

In some cases, failure to comply with the CIP may be considered failure to protect the rights, safety and well-being of subjects; such non-compliance exposes subjects to unreasonable risks. Examples: failure to adhere to the inclusion/exclusion criteria, failure to perform safety assessments intended to detect adverse events. Investigators should seek to minimize such risks by adhering to the CIP.

The PI must maintain accurate, complete, and current records, including documents showing the date of and reason for each deviation from the CIP. Relevant information for each deviation will be documented as soon as possible on the applicable CRF. The site will submit the CRF to the Sponsor.

The PI is required to adhere to local regulatory requirements for reporting deviations to IRB.

An investigator shall notify the Sponsor and the reviewing IRB of any deviation from the investigational plan to protect the life or physical well-being of a subject in an emergency. Such notice shall be given as soon as possible, but in no event later than 5 working days after the emergency occurred. Except in such an emergency, prior approval by the Sponsor is required for changes in or deviations from a plan, and if these changes or deviations may affect the scientific soundness of the plan or the rights, safety, or welfare of human subjects, FDA and IRB is also required.

8.2 SAFETY REPORTING

Safety surveillance within this study and the safety reporting performed both by the investigator and Sponsor for these market release devices starts after the indicated devices have been implanted and as soon as the subject is enrolled in this clinical investigation (refer to section 5.4 for enrollment timing). Procedure related adverse events, prior to both devices being successfully implanted, do not require reporting within this study.

The safety surveillance and the safety reporting will continue until the last investigational visit (six months) has been performed, the subject is deceased, the subject/investigator concludes his participation into the clinical investigation or the subject withdrawal from the clinical investigation.

For purposes of this study, any adverse event that is possibly or likely related to either device, will be collected throughout the clinical investigation. Refer to device specific user manuals. Additionally, adverse events that are possibly or likely related to treating to target ranges (detailed below) will be reported to the Sponsor on a CRF.

Adverse events will be monitored until they are adequately resolved or the subject has ended his/her participation in the trial, whichever comes first. The status of the subject's condition should be documented at each visit.

For the purposes of this clinical investigation, the following events that could be potentially caused by using the CardioMEMS™ device to manage PA pressures to target ranges in patients with HeartMate™ Left Assist devices require reporting. The following adverse events will be required to be reported within the study if they are possibly or likely related to the study procedures or to either of the study devices (see Appendix B for definitions):

- Cardiac Arrhythmias
  - Ventricular Arrhythmia
  - Supraventricular Arrhythmia
  - Both (Ventricular and Supraventricular Arrhythmia)
- Strokes regardless of their types and etiology
  - Hemorrhagic Stroke
  - Ischemic Stroke
  - Debilitating Stroke
- Other Neurological Events felt to be related to managing PA pressures
- Renal Dysfunction secondary to heart failure
- Respiratory Failure secondary to cardiovascular cause
- Right Heart Failure
- Syncope/presyncope/dizziness and hypovolemia
- Worsening Heart Failure
- Other Adverse Event that in the opinion of the investigator are suspected to be related to using the CardioMEMS device to manage PA pressures to target ranges.

All above study defined reportable events will be reported to the Sponsor, as soon as possible, but no later than 3 calendar days of first learning of the event. The Sponsor will ensure that all applicable events are reported to the relevant authorities as per regulations. The sites should notify the Sponsor of reportable adverse events by creating and saving the appropriate adverse event CRF within the electronic data capture (EDC) system. Additional information may be requested by the Sponsor in order to support the reporting of AEs to regulatory authorities. Device issues unrelated to this study, which do not meet the AE requirements by this CIP but fall under complaint definition, will be reported by investigators to Sponsor as complaints through the regular complaint reporting procedure. The investigator must notify the IRB, if appropriate, in accordance with national and local laws and regulations, of the AEs reported to the Sponsor.

8.2.1 Subject Death

All deaths that occur during the investigation, regardless of cause are to be reported to the sponsor. Subject deaths will be documented and reported to the Sponsor as soon as possible, but no later than 3 calendar days after becoming aware of the event via the applicable CRF.

8.2.2 Complaint

A complaint is defined as an inadequacy of a medical device with respect to its identity, quality, durability, reliability, safety or performance. Complaints may be submitted from the time of consent through the end of the study.

If a complaint involves an adverse event category or death as described in the protocol (section 8.2), then the investigator shall notify the Sponsor by completing the adverse event or death case report form as applicable and must provide the Sponsor with all necessary documentation needed.

If the complaint does not involve a reportable adverse event per protocol the investigator should notify the Abbott Product Surveillance Department through one of the methods listed below as soon as possible after becoming aware of a complaint.

CardioMEMS™ related complaints:
Email address: SYcomplaints@sjm.com
Toll Free: 800-722-3774
Direct: 818-364-1506
FAX: 800-756-7223

HeartMate™ pump related complaints:
Email address: MCSProductSurveillance@sjm.com
Toll Free: 800-456-1477

Complaints will be collected and reported by Abbott according to our product reporting process

8.3 SOURCE RECORDS

Source documents will be created and maintained by the investigational site team throughout the clinical investigation. The data reported on the CRFs will be derived from, and be consistent with, these source documents, and any discrepancies will be explained in writing. Additionally, sites are required to provide all relevant medical records for adverse events, ER visits, short stays or hospital admissions as requested by the sponsor.

8.4 RECORDS RETENTION

The Sponsor and the Principal Investigators will maintain the clinical investigation documents as required. Measures will be taken to prevent accidental or premature destruction of these documents. The Principal Investigator or the Sponsor may transfer custody of records to another person/party and document the transfer at the investigational site or the Sponsor's facility, as appropriate.

These documents must be retained by the investigational site for a period of 2 years after the conclusion of the clinical investigation and made available for monitoring or auditing by the Sponsor's representative or representatives of the applicable regulatory agencies.

All original source documents must be stored for the maximum time required by the regulations at the hospital, research institute, or practice in question. If original source documents can no longer be maintained at the site, the investigator will notify the Sponsor.

9 CLINICAL DATA HANDLING

The Sponsor will be responsible for the data handling. The Sponsor and/or its affiliates will be responsible for compiling and submitting all required reports to governmental agencies. Data will

be analyzed by the Sponsor and may be transferred to the Sponsor's locations worldwide and/or any other worldwide regulatory authority in support of a market-approval application.

9.1 PROTECTION OF PERSONALLY IDENTIFIABLE INFORMATION

Abbott respects and protects personally identifiable information collected or maintained for this clinical investigation. The privacy of each subject and confidentiality of his/her information will be preserved in reports and when publishing any data. Confidentiality of data will be observed by all parties involved at all times throughout the clinical investigation. All data will be secured against unauthorized access. It is the responsibility of the investigational site to ensure the removal of subject identifiers and to add the substitution of the patients ID number

9.2 DATA MANAGEMENT PLAN

A Data Management Plan (DMP) will describe procedures used for data review, database cleaning, and issuing and resolving data queries. If appropriate, the DMP may be updated throughout the clinical investigation duration. All revisions will be tracked and document controlled.

Subject data will be captured in a validated electronic data capture (EDC) system hosted by the Sponsor.

Only authorized site personnel will be permitted to enter the CRF data through the EDC system deployed by Abbott. An electronic audit trail will be used to track any subsequent changes of the entered data.

9.3 DOCUMENT AND DATA CONTROL

9.3.1 Traceability of Documents and Data

The investigator will ensure accuracy, completeness legibility and timeliness of the data reported to the Sponsor on the CRFs and in all required reports.

9.3.2 Recording Data

The CRF will be reviewed by the authorized site personnel. An appropriate comment will be provided to explain changes to data reported on the CRF.

10 DATA MONITORING

It is the responsibility of the Sponsor to ensure the clinical investigation is conducted, recorded and reported according to the approved CIP, subsequent amendment(s), applicable regulations and guidance documents.

Prior to beginning the clinical investigation, the Sponsor will contact the investigator or designee to train on the clinical investigational plan and the data collection requirements. Abbott personnel will remotely review the subject data and appropriate associated source documents and issue queries as appropriate.

11 COMPLIANCE STATEMENT

11.1 STATEMENT OF COMPLIANCE

In addition to applicable regional or local laws and regulations, this clinical investigation will be conducted in compliance with the most current version of the World Medical Association (WMA) Declaration of Helsinki and 21 CFR Parts 50, 54, 56 and 812. In the event of any conflicts, local laws and regulations will have precedence and in such cases, good faith efforts will be made to adhere to the intent of the other documents.

The investigator will sign a Clinical Trial Agreement and agrees to be compliant with it. The investigator will not start enrolling subjects or requesting informed consent from any subject prior to obtaining IRB/EC approval and relevant Regulatory Authority approval, if applicable, and authorization from the Sponsor in writing for the clinical investigation. If additional requirements are imposed by the IRB, those requirements will be followed. If any action is taken by an IRB with respect to the clinical investigation, that information will be forwarded to the Sponsor.

11.2 Quality Assurance Audits and Regulatory Inspections

The investigator and/or delegate should contact the Sponsor immediately upon notification of a regulatory authority inspection at the site. A monitor or designee will assist the investigator and/or delegate in preparing for the audit. The Sponsor may perform quality assurance audits, as required.

The Principal Investigator or institution will provide direct access to source data during and after the clinical investigation for monitoring, audits, IRB/ review and regulatory authority inspections, as required. The Principal Investigator or institution will obtain permission for direct access to source documents from the subject, hospital administration and national regulatory authorities before starting the clinical investigation.

11.3 Repeated and Serious Non-Compliance

In the event of repeated non-compliance or a one-time serious non-compliance, as determined by the Sponsor, a monitor or designee will attempt to secure compliance by one or more of the following actions:

- Visiting the investigator,
- Contacting the investigator by telephone,
- Contacting the investigator in writing,
- Retraining of the investigator.

If an investigator is found to be repeatedly non-compliant with the signed agreement, the CIP or any other conditions of the clinical investigation, the Sponsor will either secure compliance or, at its sole discretion, terminate the investigator's participation in the clinical investigation. In case of termination, the Sponsor will inform the responsible regulatory authority, as required, and ensure that the IRB is notified, either by the Principal Investigator or by the Sponsor.

12 SUSPENSION OR PREMATURE TERMINATION OF THE CLINICAL INVESTIGATION

The Sponsor reserves the right to terminate the clinical investigation at any stage, with appropriate written notice to the investigators, and IRB, if required.

A Principal Investigator, IRB or regulatory authority may suspend or prematurely terminate participation in a clinical investigation at the investigational sites for which they are responsible. The investigators will follow the requirements specified in the Clinical Trial Agreement.

If suspicion of an unacceptable risk to subjects arises during the clinical investigation or when so instructed by the IRB or regulatory authority, the Sponsor may suspend the clinical investigation while the risk is assessed. The Sponsor will terminate the clinical investigation if an unacceptable risk is confirmed. If the Sponsor completes an analysis of the reasons for the suspension, implements the necessary corrective actions, and decides to lift the temporary suspension, the Sponsor will inform the Principal Investigators, IRB, or regulatory authority, where appropriate, of the rationale, providing them with the relevant data supporting this decision. Approval from the IRB/EC or regulatory authority, where appropriate, will be obtained before the clinical

investigation resumes. If subjects have been informed of the suspension, the Principal Investigator, or authorized designee will inform them of the reasons for resumption.

If the Sponsor suspends or prematurely terminates the clinical investigation at an individual investigational site in the interest of safety, the Sponsor will inform all other Principal Investigators.

If suspension or premature termination occurs, the Sponsor will remain responsible for providing resources to fulfill the obligations from the CIP and existing agreements for following up the subjects enrolled in the clinical investigation, and the Principal Investigator or authorized designee will promptly inform the enrolled subjects at his/her investigational site, if appropriate.

13 CLINICAL INVESTIGATION CONCLUSION

The clinical investigation will be concluded when:

- All sites are closed AND
- The study is closed with the approving IRB.

14 PUBLICATION POLICY

Publications or presentations of clinical investigation methods or results will adhere to Abbott's publication policy, which is based on Good Publication Practices and International Committee of Medical Journal Editors (ICMJE) guidelines. A copy of the policy will be provided upon request of the investigator. Publication planning and authorship determinations will be overseen by the Steering Committee (see section 5.14), and investigators will be notified via email about the dissemination of study data and opportunities for involvement as authors on publications/presentations.

15 REPORTING RESULTS ON CLINCALTRIALS.GOV WEBSITE

This feasibility clinical investigation will be registered on ClinicalTrials.gov. as pre the requirements.

Appendix A: CIP Revisions

Procedure for CIP Amendments

This CIP may be amended as appropriate by the Sponsor. Rationale will be included with each amended version in the revision history table below. The version number and date of amendments will be documented.

CIP Amendments will be acknowledged by the Principal Investigators will be collected on the signature pages.

IRB/EC and relevant Regulatory Authorities, if applicable, will be notified of amendments to the CIP.

Table 3 – CIP Revision History

Amendment Number	Version	Date	Rationale	Details
Not Applicable	A	4/28/2017	First release of CIP	NA
1	B	6/15/2018	Changes to exclusion criteria and clarification of safety and death reporting timeframe	Changed exclusion criteria to allow for enrollment of MOMENTUM 3 CAP patients. Changed safety and death reporting timeframe to 3 calendar days.

Appendix B: Definitions

Non-study Specific Definitions

Adverse Event (AE)
Any untoward medical occurrence, unintended disease or injury, or untoward clinical signs (including abnormal laboratory findings) in subjects, users or other persons, whether or not related to the study medical device under clinical investigation.

Serious Adverse Event (SAE)
An SAE is any untoward medical occurrence which resulted in serious injury to a subject or other person. A serious adverse event is one that led to:

- Death
- A serious deterioration in the health of the subject, that either resulted in:
  - A life-threatening illness or injury OR
  - A permanent impairment to a body structure or a body function OR
  - An in-patient or prolonged hospitalization OR
  - A medical or surgical intervention to prevent life-threatening illness or injury or permanent impairment to a body structure or a body function OR
- Fetal distress, fetal death or a congenital abnormality or birth defect

A planned hospitalization for a pre-existing condition, or a procedure required by the CIP is not considered a serious adverse event.

Adverse Device Effect (ADE)
An adverse event related to the use of the study device when the occurrence does not meet the definition of serious.

This definition includes adverse events resulting from insufficient or inadequate instructions for use, deployment, implantation, installation, or operation, or any malfunction of the investigational medical device.

This definition includes any event resulting from the use error or from intentional misuse of the investigational medical device.

Serious Adverse Device Effect (SADE) An adverse device effect that has resulted in any of the consequences characteristic of a serious adverse event.

Study Specific Definitions

Cardiac Arrhythmias
Any documented arrhythmia that results in clinical compromise (e.g., diminished VAD flow, oliguria, pre-syncope or syncope) that requires hospitalization or occurs during a hospital stay. Cardiac arrhythmias are classified as 1 of 2 types:
1) Sustained ventricular arrhythmia requiring defibrillation or cardioversion.
2) Sustained supraventricular arrhythmia requiring drug treatment or cardioversion.

Hospitalization
Defined as an admission to the hospital for greater than or equal to 24 hours.

Heart Failure (HF) Hospitalization
HF hospitalization meets the definition of hospitalization and is further determined to be related to heart failure when the diagnosis of heart failure is listed on the discharge diagnosis.

Neurologic Dysfunction
Any new, temporary or permanent, focal or global neurological deficit, ascertained by a standard neurological history and examination administered by a neurologist or other qualified physician and documented with appropriate diagnostic tests and consultation note; or an abnormality identified by surveillance neuroimaging. The examining physician will classify the event as defined below:

a. Transient ischemic attack*, defined as an acute transient neurological deficit conforming anatomically to arterial distribution cerebral ischemia, which resolves in < 24 hours and is associated with no infarction on brain imaging (head CT performed >24 hours after symptom onset; or MRI)
b. Ischemic Stroke*: a new acute neurologic deficit of any duration associated with acute infarction on imaging corresponding anatomically to the clinical deficit, or a clinically covert ischemic stroke seen by surveillance imaging, without clinical findings of stroke or at the time of event recognition.
c. Hemorrhagic Stroke*: a new acute neurologic deficit attributable to intracranial hemorrhage (ICH), or a clinically covert ICH seen by surveillance imaging, without clinical findings of ICH at the time of event recognition.
d. Encephalopathy: Acute new encephalopathy** due to hypoxic-ischemic injury (HIE), or other causes, manifest as clinically evident signs or symptoms, or subclinical electrographic seizures found by complete neurological diagnostic evaluation to be attributable to acute global or focal hypoxic, or ischemic brain injury not meeting one of ischemic stroke or ICH events as defined above.
e. Seizure of any kind
f. Other neurological event (non-CNS event): examples include neuro muscular dysfunction or critical care neuropathy

*Modified Rankin Score will be used to classify the severity of all strokes (See Appendix E: Modified Rankin Score)
**Acute encephalopathy is a sign or symptom of some underlying cerebral disorder, and is manifest as depressed consciousness with or without any associated new global or multifocal neurologic deficits in cranial nerve, motor, sensory, reflexes and cerebellar function.

Renal Dysfunction
Two categories of renal dysfunction will be identified:

Acute Renal Dysfunction

Abnormal kidney function requiring dialysis (including hemofiltration) in Subjects who did not require this procedure prior to implant, or a rise in serum creatinine of greater than 3 times baseline or greater than 5 mg/dl sustained for over 48 hours.

Chronic Renal Dysfunction
An increase in serum creatinine of 2 mg/dl or greater above baseline, or requirement for hemodialysis sustained for at least 90 days.

Right Heart Failure
Symptoms and signs of persistent right ventricular dysfunction requiring RVAD implantation, or requiring inhaled nitric oxide or inotropic therapy for a duration of more than 1 week at any time after LVAD implantation.

Syncope/Presyncope/dizziness or hypovolemia
Transient sensation that may lead to inability to maintain an upright posture. Can be felt as lightheadedness, muscular weakness, blurred vision, feeling faint and. In extreme cases could leave to fainting (syncope).

Appendix C: NYHA Classification

NYHA Classification must be performed by an advanced practice physician, or by an experienced clinician designated by the principal investigator in writing.

Table 4 – NYHA Classification

Classification	Definition
I	Cardiac disease without resulting limitations of physical activity. Ordinary physical activity does not cause undue fatigue, palpitations, dyspnea or chest pain.
II	Cardiac disease resulting in slight limitation of physical activity. Subjects are comfortable at rest. Ordinary physical activity results in fatigue, palpitation, dyspnea, or chest pain.
IIIA	Cardiac disease resulting in marked limitations of physical activity. Subjects are comfortable at rest. Less than ordinary physical activity causes fatigue, palpitation, dyspnea, or chest pain.
IIIB	Cardiac disease resulting in marked limitations of physical activity. Subjects are comfortable at rest. Mild physical activity causes fatigue, palpitation, dyspnea, or chest pain.
IV*	Cardiac disease resulting in inability to carry on any physical activity without discomfort. Symptoms of cardiac insufficiency or of the chest syndrome may be present even at rest. If any physical activity is undertaken, discomfort is increased.

*For all post-enrollment NYHA assessments, any patient who is inotrope dependent will be considered NYHA Class IV.

Appendix D: 6 Minute Hall Walk With CardioMEMS Readings Pre and Post Test Protocol

Purpose

The purpose of the 6-Minute Hallway Walk test (6MHWT) is to walk as far as possible for 6-minutes, without running or jogging, as a way of measuring functional status. The subject should be encouraged to walk any distance that they can, no matter how small.

Procedure

A CardioMEMS PA pressure reading will be taken two times: once before the 6 Minute Hall Walk test and immediately after the test is over. Be sure to keep the CardioMEMS hospital unit plugged in and running for the post exercise reading. At baseline, Group B will not have a CardioMEMS PA sensor implanted and thus, will not provide a reading before or immediately following the 6MHWT.

Preparing for the Test

1. Establish a 30-meter (or 100 foot) walking course in an enclosed corridor, preferably free of distractions/debris and close to a wall so that if needed, the Subject may rest against it during the test (note: a treadmill is not an acceptable alternate method for this study). You must use a measuring wheel or measuring tape to mark and establish the course.
2. Mark the course at 3-meter (ten foot) intervals using a method unnoticeable to the Subject.
3. Place noticeable markers at either end of the course to indicate the turnaround points. It is advisable to have chairs at either end in case the subject needs to rest.
4. The distance covered during the preceding walk test will not be revealed to the Subject during the study.
5. A warm up prior to the test should NOT be performed. It is suggested that for accuracy the patient be brought to the starting point in a wheel chair so as not to cause undue fatigue prior to the test.
6. Staff should not walk with or pace the patient during the test.
7. If the patient is significantly symptomatic, please encourage the patient to take as many steps as are possible and measure this distance.

Explaining the Test Procedure to the Subject

1. Clearly explain to the Subject what is required of him/her using the following instructions verbatim:

   THE PURPOSE OF THIS TEST IS TO WALK AS FAR AS POSSIBLE FOR SIX-MINUTES. YOU WILL START FROM THIS POINT AND FOLLOW THE HALLWAY TO THE MARKER AT THE END, THEN TURN AROUND AND WALK BACK. WHEN YOU ARRIVE BACK AT THE STARTING POINT, YOU WILL GO BACK AND FORTH AGAIN. YOU WILL GO BACK AND FORTH AS MANY TIMES AS YOU CAN IN THE SIX-MINUTE PERIOD. IF YOU NEED TO, YOU ARE PERMITTED TO SLOW DOWN, TO STOP, AND TO REST AS NECESSARY. YOU MAY LEAN AGAINST THE WALL WHILE RESTING, BUT RESUME WALKING AS SOON AS YOU ARE ABLE. HOWEVER, THE MOST IMPORTANT THING ABOUT THE TEST IS THAT YOU COVER AS MUCH GROUND AS YOU POSSIBLY CAN DURING THE SIX MINUTES. I WILL KEEP TRACK OF THE NUMBER OF LAPS YOU COMPLETE AND I WILL LET YOU KNOW WHEN THE SIX MINUTES ARE UP. WHEN I SAY STOP, PLEASE STAND RIGHT WHERE YOU ARE. YOU MAY LEAN AGAINST THE WALL IF YOU NEED TO DURING THE TEST.

DO YOU HAVE ANY QUESTIONS ABOUT THE TEST?

PLEASE EXPLAIN TO ME WHAT YOU ARE GOING TO DO.

2. The Subject will re-state the instructions. If the Subject does not seem to understand, repeat the entire instructions until the patient can re-state them and verbalize them.

Conducting the Test

1. Position the Subject at the starting line.
2. Repeat the sentence:
   THE MOST IMPORTANT THING ABOUT THE TEST IS THAT YOU COVER AS MUCH GROUND AS YOU POSSIBLY CAN DURING THE SIX MINUTES.

   ARE YOU READY?

   START NOW, OR WHENEVER YOU ARE READY.
   Start the timer as soon as the Subject takes the first step.
3. During the test, the walking pace of the Subject should not be influenced. The test supervisor must walk behind the Subject – do not walk with, rush up behind, or rush past the Subject.
4. Each time the Subject returns to the starting line, record the lap.
5. While walking, encourage the Subject at one minute intervals with the following phrases:

   1 minute: YOU ARE DOING WELL. YOU HAVE 5 MINUTES TO GO.
   2 minutes: KEEP UP THE GOOD WORK. YOU HAVE 4 MINUTES TO GO.
   3 minutes: YOU ARE DOING WELL. YOU ARE HALFWAY DONE.
   4 minutes: KEEP UP THE GOOD WORK. YOU HAVE ONLY 2 MINUTES LEFT.
   5 minutes: YOU ARE DOING WELL. YOU HAVE ONLY ONE MINUTE TO GO.

6. The Subject should only be spoken to only during the 1-minute encouragements; no response should be made to the Subject's questions about the time and distance elapsed.

   a. If the Subject is not concentrating on the walking, the Subject can be reminded at a 1-minute mark:

      THIS IS A WALKING TEST, TALKING WILL UTILIZE YOUR ENERGY RESERVE AND INTERFERE WITH YOUR PERFORMANCE.

7. When only 15 seconds remain, state:

   IN A MOMENT I AM GOING TO TELL YOU TO STOP. WHEN I DO, STOP RIGHT WHERE YOU ARE AND I WILL COME TO YOU.

8. When the timer reads 6-minutes (or zero if counting down), instruct the Subject to STOP and walk over to him/her. Bring the wheel chair to the place where the subject stopped. Mark the spot where the Subject stopped.

9. If the Subject wishes to stop walking during the test or;
10. If the Subject is slowing down and expresses that he/she wants to pause, keep the timer running and state:

REMEMBER, IF YOU NEED TO, YOU MAY LEAN AGAINST THE WALL UNTIL YOU CAN CONTINUE WALKING AGAIN.

11. If the Subject wishes to stop before the 6-minutes are complete and refuses to continue (or you decide that he/she should not continue), provide a chair/ wheelchair for the Subject to sit on and discontinue the test. Record the distance completed, the time the test was stopped and the reason for pre-maturely stopping.

Immediately Following the Test

1. Write the number of completed laps and add the additional distance covered in the final partial lap. Immediately take the patient back to the CardioMEMS hospital unit and record the post exercise CardioMEMS reading. After the patient leaves, use the work sheet to calculate laps and record the distance walked to the nearest foot or meter.
2. Observe the Subject for at least 10 minutes after the test is completed to ensure adequate recovery. Observation can be accomplished while taking the post effort CardioMEMS PA reading.

Appendix E: Modified Rankin Score

Table 5 – Modified Rankin Score

Score	Definition[1]
0	No observed neurological symptoms
1	No significant neurological disability despite symptoms; able to carry out all usual duties and activities
2	Slight neurological disability; unable to carry out all previous activities, but able to look after own affairs without assistance
3	Moderate neurological disability; requiring some help, but able to walk without assistance
4	Moderate severe neurological disability; unable to walk without assistance and unable to attend to own bodily needs without assistance
5	Severe neurological disability; bedridden, incontinent and requiring constant nursing care and attention as a result of a neurological deficit
6	Dead

[1] van Swieten J, Koudstaal P, Visser M, Schouten H, *et al* (1988). "Interobserver agreement for the assessment of handicap in stroke Subjects". *Stroke* **19** (5): 604-607

Appendix F: Management of Hemodynamic Parameters

The CardioMEMS HF System allows intermittent assessment of pulmonary artery systolic, diastolic and mean pulmonary artery pressures. Hemodynamic information obtained by the system should be used for clinical decision making in addition to symptoms, weights or physical examination (traditional markers of volume).

Target Pulmonary Artery Diastolic Pressure Range: 8 - 15 mmHg

Initially, thresholds will be set automatically at the CardioMEMS commercially acceptable range. The physician will then adjust the thresholds to the specified range above, specifically for each patient. These threshold notifications are intended to guide the physician to review the Merlin.net website. Every attempt should be made to keep the pulmonary artery pressures within the specified pulmonary artery pressure ranges utilizing the guidelines. In order to clinically manage patient's PA pressures, the physician must review the PA pressure measurements on a frequent basis, for example, some patients may require a daily review of their PA pressure measurements, while some patients may need a weekly review. The physician or designee has unlimited access to the Merlin.net website.

An elevation of pressures beyond the patient's pressure ranges should be considered a volume overloaded status and should be managed using one of the recommended treatment options listed below.

A decrease in the pulmonary pressures below the patient's pressure ranges should be considered a volume depletion event and managed using one of the recommended treatment options listed below.

Diuretics and vasodilators should be adjusted based on the patient's baseline diuretic requirement, knowledge of the patient's prior response to these agents, and clinician judgment to accomplish the pressure goals set forth in this guideline.

The PA pressure readings should be used in addition to weights, signs and symptoms, laboratory values and other traditional markers of volume in the management of heart failure. It is important to review the trend of PA pressures. As with all other diagnostic information, physicians should consider the entire medical history of each patient when initiating or modifying therapies.

Recommended Treatment Options:

- Diuretic Management
- Vasodilators such as nitrates and hydralzine
- Titration of HF medications
- LVAD Speed Changes

Table 6 – Recommended Frequency of CardioMEMS HF System Review

Subject Status	Weekly	At least 2– 3 times per week until optivolemic
Acceptable PA Pressure (Opti-volemic)	X	
Elevated PA Pressure (Hyper-volemic)		X
Low PA Pressure(Hypo-volemic)		X

Appendix G: Bibliography

1. Abraham WT, Adamson PB, Bourge RC, Aaron MF, Costanzo MR, Stevenson LW, Strickland W, Neelagaru S, Raval N, Krueger S, Weiner S, Shavelle D, Jeffries B, Yadav JS and Grp CTS. Wireless pulmonary artery haemodynamic monitoring in chronic heart failure: a randomised controlled trial. *Lancet*. 2011;377:658-666.
2. Park SJ, Milano CA, Tatooles AJ, Rogers JG, Adamson RM, Steidley DE, Ewald GA, Sundareswaran KS, Farrar DJ and Slaughter MS. Outcomes in advanced heart failure patients with left ventricular assist devices for destination therapy. *Circ Heart Fail*. 2012;5:241-8.
3. Pagani FD, Miller LW, Russell SD, Aaronson KD, John R, Boyle AJ, Conte JV, Bogaev RC, MacGillivray TE, Naka Y, Mancini D, Massey HT, Chen L, Klodell CT, Aranda JM, Moazami N, Ewald GA, Farrar DJ, Frazier OH and HeartMate III. Extended mechanical circulatory support with a continuous-flow rotary left ventricular assist device. *J Am Coll Cardiol*. 2009;54:312-21.
4. Rogers JG, Aaronson KD, Boyle AJ, Russell SD, Milano CA, Pagani FD, Edwards BS, Park S, John R, Conte JV, Farrar DJ, Slaughter MS and HeartMate III. Continuous flow left ventricular assist device improves functional capacity and quality of life of advanced heart failure patients. *Journal of the American College of Cardiology*. 2010;55:1826-34.
5. Estep JD, Starling RC, Horstmanshof DA, Milano CA, Selzman CH, Shah KB, Loebe M, Moazami N, Long JW, Stehlik J, Kasirajan V, Haas DC, O'Connell JB, Boyle AJ, Farrar DJ, Rogers JG and Investigators RS. Risk Assessment and Comparative Effectiveness of Left Ventricular Assist Device and Medical Management in Ambulatory Heart Failure Patients: Results From the ROADMAP Study. *J Am Coll Cardiol*. 2015;66:1747-61.
6. Jermyn R, Alam A, Kvasic J, Saeed O and Jorde U. Hemodynamic-guided heart-failure management using a wireless implantable sensor: Infrastructure, methods, and results in a community heart failure disease-management program. *Clinical cardiology*. 2016.
7. Lampert BC and Emani S. Remote hemodynamic monitoring for ambulatory left ventricular assist device patients. *Journal of thoracic disease*. 2015;7:2165-71.
8. Rosenkranz S and Preston IR. Right heart catheterisation: best practice and pitfalls in pulmonary hypertension. *European respiratory review : an official journal of the European Respiratory Society*. 2015;24:642-52.

Appendix H: Informed Consent Form

A sample informed consent will be provided under separate cover.

STUDY TITLE AND NUMBER	**INTELLECT 2 Study**
SPONSOR	**Abbott**
PRINCIPAL INVESTIGATOR	***Name of principal investigator*** ***Address***
SITE NAME	***Institution/Site Name*** ***Address***

Introduction

You are being asked to take part in a research study. The study will evaluate how your doctor can most effectively use the CardioMEMS™ HF Monitoring system and with your HeartMate™ Left Ventricular Assist Device (LVAD) to manage your heart failure (HF). You were asked because you have heart failure. You also have or will shortly have two medical devices known to treat HF. In heart failure, the heart has reduced efficiency. Heart failure is treated with medications. In some instances, it is also treated with implanted medical devices.

Your doctor previously determined that you would benefit from the HeartMate device. You may have also have previously been implanted or will soon be implanted with the CardioMEMS HF monitoring system. The CardioMEMS system detects changes in pressures, which can serve as an early warning that your HF is worsening. If you already have this device implanted, it is currently providing information to your doctor. However, very little information can be found on how to use these two devices together to give you the greatest benefit.

This study is an early learning study. It will try to better understand how when using these two devices together, a doctor might improve your symptoms and possibly your rate of rehospitalization.

This form explains why this research study is being done and what your role will be if you decide to participate. This form also talks about the possible risks that may happen if you take part in this study. The study is sponsored by Abbott. This company manufactures medical devices.

Please read this form carefully. Ask your study doctor any questions you may have about the research study. Make sure your questions are answered before you decide if you want to take part in this study. Please take your time and talk about this information with your family, friends, or family doctor.

This consent form may contain some words that you do not understand. It is important that you understand what is in this form. It will explain the different activities you will be asked to do or participate if you take part in the research study and what the risks might be; whether or not you do take part is entirely your choice. Please ask the study doctor or the study staff to explain any words or information that you do not understand.

If you decide you want to take part in the research study, you will be asked to sign the consent section before any study-related activities are performed. By signing it you are telling us that you:

- Understand what you have read
- Consent to take part in the research study
- Consent to have the tests and treatments that are described
- Consent to the use of your personal and health information as described.

Taking part in this research study is entirely voluntary. If you don't wish to take part, you don't have to. You will receive the best possible care whether or not you take part in the study. Refusing participation will not involve any penalty or loss of benefit. If you decide to take part in this study, you must sign your name at the end of this form. No research study activity can be performed until you sign this form.

What is the purpose of this study?

The purpose of this research study is to determine if patients with Heart Failure who have a HeartMate LVAD and also a CardioMEMS HF Monitoring system when doctors apply management strategies will improve how they feel and what they can to do. The purpose of this small study is to better understand how these two devices can be used together to help heart failure patients. About one hundred patients will participate in this study at approximately twenty sites in the United States. Some of these tests are part of your normal care and would be done even if you were not in the study. The study team at this hospital will let you know which tests are not considered to be part of your normal care.

There are no experimental procedures in this study. The devices and procedure used in this study are FDA approved and part of standard of care. You are already using both devices independently from one another. No devices will be implanted outside of standard approved indication for this study. We hope to learn how to best use the information gained from the two devices to the maximum benefit in Heart Failure treatment.

What will be requested from you if you take part in this research study?

Your doctor will decide if you qualify to take part in the INTELLECT 2 HF study. If you are a candidate, you will be asked to provide informed consent by signing and dating the study consent form after all of your questions have been asked and answered. In order to qualify, both of your devices need to be working properly. If your device or devices are not working properly, you will not be able to participate in the study and will be withdrawn.

If your doctor determines that you qualify, and you decide to take part in this research study, you will come for four study visits over six months. The following tests will be performed at the visits:

Study Visit	Study Procedures and Data Collection
Baseline (first visit)	1. Questions about your medical history 2. Checking of your vital signs 3. Assessment of your functional capacity 4. Assessment of your quality of life 5. Recording of your current heart medications 6. Recording of your current LVAD pump information 7. Review of your data from your CardioMEMS device including reviewing online measurements taken since your implant and prior to your study participation 8. Walking for six minutes and recording the distance and taking a CardioMEMS PA reading at rest before walking and again immediately after the walk
One month after first visit or CardioMEMS implant	1. Checking of your vital Signs 2. Assessment of your functional capacity 3. Assessment of your quality of life 4. Recording of your current cardiovascular medications 5. Recording of your current LVAD pump information 6. Seeing how far you can walk in six minutes and recording CardioMEMS PA reading at rest before the walk and immediately following the walk
Three months after first visit or CMEMS implant	1. Same assessments as Month 1
Six months after first visit or CMEMS implant	1. Same assessment as Month 1 2. End of your study participation 3. Review of your online CardioMEMS readings
As it happens	1. Documentation of all hospitalization and all unscheduled clinic visits for worsening Heart Failure, cardiovascular medication and/or volume management 2. Measuring of CardioMEMS data when performing a Right Heart Catheterization if doing the procedure for another reason 3. Measuring of CardioMEMS data if testing your LVAD is indicated 4. Reviewing of your CardioMEMS data on the Merlin.net website including old data from before your participation in this study to better understand your condition

There may be a representative of the sponsor at your study visits and the representative may carry out some of the study procedures. The sponsor might help your doctor to take readings from your CardioMEMS during your six minute walk tests.

How long will the study last?

If you agree to take part in the research study, your involvement will last approximately six months unless you no longer have two devices, in which case, your participation would end. Each visit will take approximately thirty minutes.

About 100 people will take part in this research study at about 25 sites in the United States.

What are the possible risks and discomforts?

There are no known risks to participating in this study, but there may be some discomforts or inconveniences associated with the study tests and procedures which are listed below.

Six Minute Walk Test:

- You many become tired from walking
- You might trip or fall while walking

It is not expected that this risk is any greater than what occurs in your own daily life. The walking test will be done at your own pace. You will be asked to cover as much distance as is possible. Study personnel will be there to assist you if you get tired.

There may be other risks or discomforts to you (or to an embryo, unborn child or nursing infant if you become pregnant) that are not known at this time. If important information is learned during the course of this research study, your doctor will be notified by Abbott. Your doctor will discuss with you important new information that is learned during the course of this study that may affect your condition or willingness to continue to take part in this research study.

What are the risks for women of childbearing age?

If you are pregnant or plan to become pregnant in the next six months, you should discuss your participation with your study doctor. Patients who become pregnant while taking part in the study should contact the study doctor right away.

What are the possible benefits to you or others?

There may be no direct benefit to you should you decide to participate in this study. However, the information gathered from this research study might help your doctor to understand ways to better manage your heart failure using your two devices. It is hoped that the overall study results may benefit heart failure patients with Left Ventricular Assist Devices. The information could be published in medical journals to help other physicians or it could be used to design future larger studies.

If you decide to take part in this research study, you may feel better, but there is no guarantee that this will happen. While there is no guarantee that anything will be learned, our hope is to help advance our understanding of heart failure.

If you do not want to take part in this research study, what other options are available to you?

Your participation in this study is voluntary. You can choose not to participate in the study. If you decide not to participate in the study, you will still be able to continue receiving your current treatment(s) for heart failure. Your study doctor will discuss other treatment options available to you.

If you decide to participate in the research study, but decide to withdraw your participation at a later time, you are welcome to do so without any penalty or loss of benefit.

If you choose to take part in this study, what are the costs?

There will be no cost to you for participating in this study. The study sponsor will pay your doctor for his time at his standard rate when conducting study visits. Your insurance will not be billed for any study related tests or study required visits. However, any costs related to your care or routine management of your heart failure or devices that are outside of the study will be your responsibility.

What if you are injured because of this study?

If you suffer any injuries, illnesses, or complications as a direct result of participation in this study, medical treatment will be available to you. You or your insurance company will be responsible for all costs resulting from such treatment. No other arrangement has been made for other compensation (such as lost wages, lost time or discomfort) with respect to such injuries. However, signing this consent form in no way limits your legal rights against the Sponsor, investigators, or anyone else, and you do not release the study doctors or participating institutions from their legal and professional responsibilities.

During the study, if you experience any injuries, illnesses, or complications from taking part in this research study, please contact Dr. _____ at ___-___-_____.

What are your rights if you decide to take part in this research study?

Your signature on this consent form means that you have received information about this research study and that you agree to be a part of the research study.

You may stop taking part in the research study at any time without penalty or loss of benefits to which you are otherwise entitled. If you wish to stop taking part in this research study for any reason, you should contact Dr. _____ at ___-___-_____.

If you do withdraw your consent during the study, the study doctor and relevant study staff will not collect additional personal information from you, although personal information already collected will be retained to ensure that the results of the research study project can be measured properly and to comply with the law. You should be aware that data collected by the sponsor up to the time you withdraw will be part of the study results. New findings during the course of the study that may affect your continued participation shall be provided to you.

Your study doctor or designee will discuss with you what follow-up is required if you decide to withdraw, or are withdrawn from the research study before the study is finished. Your doctor or the sponsor of the study (Abbott) may also stop your participation in the research study at any time, without your consent, for any reason.

How will your information be kept confidential?

If you decide to take part in this research study, your medical records and personal information will be kept confidential to the extent allowed by Federal, State, and local law. However, information from the study may be exported to countries where different data protection laws apply. The data protection laws in other countries may be less strict than those of your country.

If you decide to participate in the research study, the study sponsor and others who work with the study, such as the study staff and Institutional Review Board (IRB) will see health information about you. The IRB is a group of people who perform independent review of research study as required by laws governing this type of research study.

The information collected about you may be used in several ways. Information about you and your health that might identify you may be given to others to carry out the research study. Your study doctor may use some of the information in making decisions about your care.

The sponsor may use the information in any of the following ways:

- To analyze and make conclusions about the results of the study,
- For reporting undesirable events to the FDA and other government health agencies,
- To provide overall study results to other study doctors, including in publications,
- To conduct new medical research study, to reanalyze the study results in the future or to combine your information with information from other studies,
- To develop new medical products and procedures, and other product-development related activities.
- To assist with submitting insurance claims and processing reimbursement requests,
- To provide business and research partners, affiliates, organizations, or companies who perform services on behalf of the sponsor or your study doctor for purposes related to the study or resulting events or other research.

While using the information in these above mentioned ways, the sponsor may give study data to its affiliated companies in the U.S. or other countries. The sponsor may also share the information with its research or business partners or companies it hires to provide study-related services. Information received during the research study will not be used for any mailing lists or sold to anyone for marketing purposes.

Your name or identifying information will not be provided for publications in medical journals. Data which has all identifying information removed is called “de-identified data”. Your permission for the use, retention, and sharing of your de-identified health information will continue indefinitely.

Your permission for the use, retention, and sharing of your identifiable health information will expire once the study is completed and closed.

A description of this clinical study will be available on http://www.ClinicalTrials.gov, as required by U.S. Law. This Web site will not include information that can identify you. At most, the Web site will include a summary of the results. You can search the Web site at any time. Please note information may not be available on ClinicalTrials.gov until the study is completed and the device is marketed.

Who can you contact for study information?
If you have any questions about the study or taking part in this research study, please contact Dr. _____ at ___-___-_____.

In addition, if you have any concerns, complaints or questions about your rights as a research study patient or an injury that you believe is a study-related, please contact:

Name of person at IRB/EC:
Title of person at IRB/EC:
IRB/EC phone number:
IRB/EC email, if known:

Consent and authorization for participation in this research study
Taking part in this research study is entirely voluntary. You are making a decision on whether or not to take part in the research study. Your signature indicates that you have read the information in this form and have decided to take part in the research study. You will be given a signed copy of this form to keep.

- I have read all of the above information in this consent and authorization form. I have had the opportunity to ask questions and have received answers concerning areas I did not understand.
- I willingly give my consent to participate in this study and to comply with the procedures related to it.
- I confirm that my data collected or reviewed during the study will be used in the study analysis and my deidentified data may be included in publications.
- I understand that I am free to refuse to participate in the proposed study, without giving any reason and without my medical care or legal rights being affected.
- I understand that I am free to withdraw from the proposed study at any time, without giving any reason, without my medical care or legal rights being affected.
- I give my permission to representatives from the sponsor, [the ethics committee] and the regulatory authorities to access and use my medical records.and personal information as described in this form.
- I understand that my personal physician may be informed of my participation in this research study.

Name of Participant (please print) _____

Signature _____ Date _____

Name of Person Obtaining Consent (please print) _____

Signature _____ Date _____