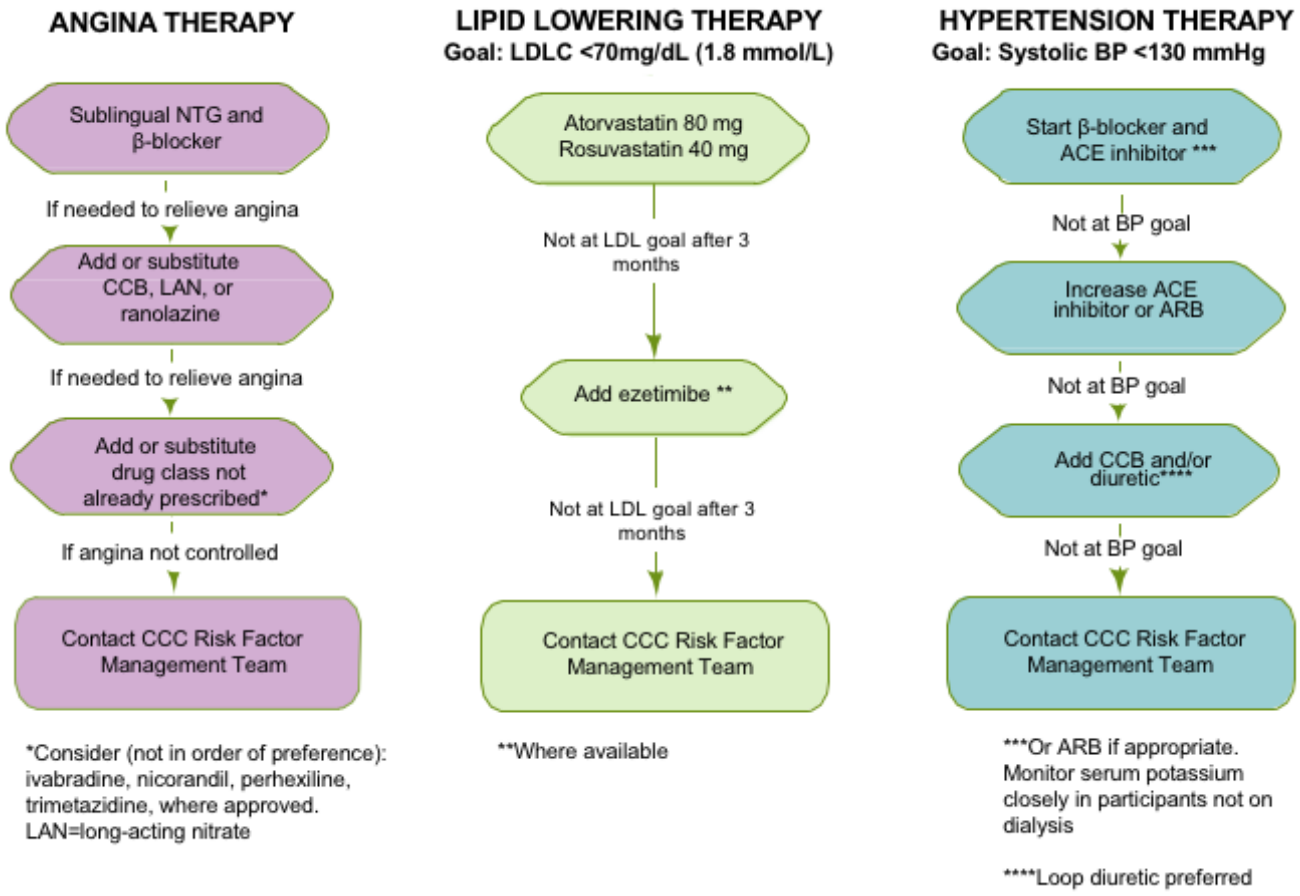
Supplementary Appendix

This appendix has been provided by the authors to give readers additional information about their work.

Contents

eFigure 1. OMT Algorithm



eTable 1. Strategies to minimize contrast induced acute kidney injury after cardiac catheterization/PCI

- Pre-, intra- and post-procedure hydration
  - Protocol used in the POSEIDON trial:
    - Initiate 3mL/kg/h of normal saline (NaCl 0.9%) IV, for at least 1 hour prior to angiography
    - Measure LVEDP prior to contrast administration
    - Adapt infusion rate based on LVEDP measurement as follows:
      - 5 mL/kg/hr for LVEDP < 13 mm Hg
      - 3 mL/kg/hr for LVEDP of 13 mm Hg to 18 mm Hg
      - 1.5 mL/kg/hr for LVEDP > 18 mm Hg
    - Continue fluid administration for 4 hours post procedure
  - Simplified protocol based on LVEF (expert opinion):
    - Participants with preserved EF
      - IV 0.9% NS at 1 cc/kg/hour for 12 hours pre- and post-procedure
  - Participants with EF<40%
    - IV 0.45% NS at cc/cc replacement (urine output should be match to maintain euvolemic state) for 12 hours pre- and post-procedure
- Pre-procedure high dose statins
- Avoid nephrotoxic agents for at least 48 hours prior
- Use iso- or low-osmolar contrast agents
- Limit contrast used: Ultra-low/Zero volume contrast techniques (IVUS guided PCI)
  - Use small diameter catheters (i.e., 5–6 French) without side-holes
  - All contrast injections require simultaneous cine angiogram, i.e., ‘‘no dye without the cine’s eye.’’
  - Limit the volume of contrast injected from the catheter to 1–2 cm^3 per injection using a 3-cm^3 syringe.
  - During PCI, prior to exchange of devices such as balloon catheters, remove contrast from the guide catheter by back bleeding contrast out of the ‘‘Y’’ connector.
  - If available, display previous angiographic images (including angiography from past procedures) alongside active fluoroscopy screen as a reference to use as guidance during guide wire, balloon, stent and ultrasound passage.
  - Absolutely no contrast ‘‘puffing’’/test injections during the procedure.
  - Use IVUS liberally for pre-PCI assessment of the lesion, selection of therapeutic modalities, and post-PCI result assessment.
  - Avoid ventriculography
  - Use of biplane if available
- Consider ischemia-guided revascularization
- Consider staged PCI for complex multivessel disease

IV= intravenous; IVUS= intravascular ultrasound; LVEDP= left ventricular end diastolic pressure; LVEF= left ventricular ejection fraction; PCI= percutaneous coronary intervention

eTable 2. Strategies to minimize acute kidney injury after CABG

Consider delay of surgery ≥7 days from time of cardiac catheterization
Use of off pump CABG may be reasonable
Renally dose all medications
In patients undergoing on pump CABG, maintain perioperative hematocrit > 19% and mean arterial pressure > 60 mmHg

CABG= coronary artery bypass graft surgery

eTable 3. Schedule of Follow-Up

Schedule of Study Assessments and Procedures (Protocol Date: Jan. 06.2014)

	Screening visit	Randomization visit (Baseline Visit)	Catheterization & PCI or CABG	Follow up								
				1.5m[A] Visit 1	3m[A] Visit 2	6m[B] Visit 3	12m[A] Visit 4	18m[B] Visit 5	24m Visit 6	30m[B] Visit 7	36m[C] Visit 8	Frequency beyond 36 months
Eligibility screen	X											
Informed consent (including biorepository consent if applicable)	X											
Creatinine and pregnancy test[D]	X											
Medical History/Medical Status	X	X		X	X	X	X	X	X	X	X	Q6m
Cardiovascular medications	X	X		X	X	X	X	X	X	X	X	Q6m
NYHA* and CCS class**	X	X		X	X	X	X	X	X	X	X	Q6m
Release for medical records signed		X					X		X		X	Q12m
Safety assessment[G]			X									
Vital signs, weight, height[H]		X		X	X	X	X	X	X	X	X	Q12m
Standard lab results[I]		X[J]			X	X	X	X	X	X	X	Q12m
Biorepository blood draw		X			X							
Cardiac biomarkers[L]			X									
Electrocardiogram (ECG) [M]		X	X[N]				X		X			@ closeout
Lifestyle Assessment (PACE)***		X			X		X		X		X	Q12m
Lifestyle Counseling (PACE)***		X		X	X	X	X	X	X	X	X	Q6m
Morisky Green Levine Medication Adherence		X				X	X	X	X	X	X	Q6m
Brief symptoms/QOL assessment[P]		X		X	X	X	X	X	X	X	X	Q6m
Initiate Optimal Medical Therapy (OMT)		X										
Medical Therapy Evaluation and Optimization[Q]				X	X	X	X	X	X	X	X	Q6m
Schedule catheterization for INV participants[R]		X										
Hospitalization assessment				X	X	X	X	X	X	X	X	Q6m
Endpoint assessment			X	X	X	X	X	X	X	X	X	Q6m

Follow-up visits will be scheduled based on time since the date of randomization (baseline).

*****NYHA- New York Heart Association **CCS- Canadian Cardiovascular Society ***PACE- Patient-centered Assessment and Counseling for Exercise and nutrition (PACE) assessment and counseling

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[A] 1.5, 3, and 12 month visits should be in clinic visits, depending on participant stability, risk factor control, and geography.

[B] 6, 18, and 30 month visits may be via telephone, email, or in clinic depending on participant stability, risk factor control, and geography.

[C] Following the 36 month visit, follow-up visits should be in clinic visits at least every 12 months. Clinic visits can be replaced by email or phone depending on participant stability, risk factor control, and geography.

[D] Creatinine if not done within 90 days and pregnancy test if premenopausal.

[F] CCTA not performed if estimated glomerular filtration rate < 60ml/min (unless requested by the treating physician) and not performed in other selected participants (see [G] Safety Assessment (refer to section 13.4).

[H] Height is only needed at randomization, assessments only required if visit is completed in clinic.

[I] Required labs include: lipids (preferably fasting) at 3 month visit then semiannually only, and HbA1c (at visit 4, 6, 8 and annually thereafter for diabetic participants. These lab results will be requested from the participant's physician. If these results are not available they should be obtained by either the participant's treating physician or study staff. Creatinine values obtained clinically for participants with eGFR <60 at the three month follow-up visit and annually will also be recorded.

[J] Additional lab required at randomization includes complete blood count Request from participant's physician, since it is expected that routine blood work will have been done within the last 6 months

[K] May be requested.

[L] For participants undergoing PCI: troponin and CK-MB pre-procedure and at 8-16 ± 2 hours post-PCI or at hospital discharge, whichever comes earlier. For participants undergoing CABG: troponin and CK-MB pre-procedure and at 18 ± 6 hours post-CABG. All biomarker measurements should be recorded on eCRF. A biomarker measurement should be obtained before and after all PCI and CABG procedures, whenever possible.

[M] Send to ECG core lab; ECG required for all cardiac admissions and revascularizations; year 1 ECG optional (filed on site) and closeout.

[N] ECG done following procedure (60±30 mins post-PCI, 3 days post-CABG).

[O] Seattle Angina Questionnaire/Duke Activity Status Index/Rand general health status item/Perceived Stress Scale/Patient Health Questionnaire/Life Orientation Test – Revised/EQ-5D/Demographic characteristics. Not required for the ISCHEMIA CKD ancillary trial.

[P] Selected Seattle Angina Questionnaire/Rose dyspnea scale/EQ-5D.

[Q] At every follow-up visit the research team, in collaboration with the treating physician(s), will evaluate effectiveness of medical therapy and optimize as needed according to guideline recommendations and study algorithms.

[R] Planned cath and revascularization only in the INV group. See MOO for time windows for performing cath and revascularization after randomization. Catheterization and optimal revascularization treatment should be targeted within 30 days after randomization in the Invasive strategy group. In the Conservative group, catheterization and optimal revascularization is reserved for participants with refractory angina symptoms or acute ischemic events.

eTable 4. Definitions of Clinical Endpoints

Death
All deaths will be adjudicated and classified as cardiovascular, non- cardiovascular or undetermined. Cardiovascular deaths are defined as all deaths excluding those for which the principal and underlying cause is solely non-cardiovascular. Any death for which a cardiovascular contributing cause is suspected will also be considered a cardiovascular death.

Myocardial Infarction
Two versions of MI will be adjudicated in ISCHEMIA-CKD: a primary definition and secondary definition. Each definition includes a hierarchy of markers and threshold values as well as a set of rules for diagnosing MI when one or more key elements of the medical record are missing.

The Primary Definition is based upon the Universal Definition of MI, but relies upon site- reported MI decision limits for troponin (which may or may not be the same as the manufacturer 99%URL), and has selected unique marker criteria for MI after PCI or CABG (Type 4a, 5).

The Secondary Definition is also based upon the Universal Definition of Myocardial Infarction, but specifically uses the 99%URL from the assay manufacturer's package insert (which may or may not be the site's MI decision limit) and uses the same supporting criteria (eg. angiographic and ECG) as the UMI definition.

All MI events will be classified based on the Universal MI classification system as follows:

- Type 1: Spontaneous MI
- Type 2: Secondary MI
- Type 3: Sudden Death MI
- Type 4a: MI related to PCI
- Type 4b: MI related to stent thrombosis
- Type 4c: MI related to stent restenosis
- Type 5: MI related to CABG
- Silent MI

Spontaneous MI (Types 1, 2, 4b, 4c)
Diagnosis of spontaneous MI will be satisfied by a clinical setting consistent with acute myocardial ischemia and any one or more of the following criteria:

Marker elevation, as outlined below and at least 1 of the following:

- Symptoms of ischemia, usually lasting > 20 minutes in duration
- New ischemic ST and/or T wave and/or Q-wave ECG changes, or new LBBB, as described below
- Imaging evidence of new loss of viable myocardium in comparison to the baseline imaging test
- Angiographic evidence of intracoronary thrombus, stent thrombosis (4b) or high- grade in-stent restenosis (≥50%) (4c)

Marker data not available and at least 2 of the following:

- New ischemic ST and/or T wave and/or Q-wave ECG changes, or new LBBB, as described below
- Imaging evidence of new loss of viable myocardium in comparison to the baseline imaging test
- Angiographic evidence of intracoronary thrombus.

Autopsy evidence of a fresh myocardial infarction as stand-alone criterion

Spontaneous MI Marker Criteria
Troponin, including high-sensitivity troponin, is the preferred biomarker and takes precedence over CK-MB for both definitions.

Primary Definition: Preferentially uses a troponin threshold value reported as MI Decision Limit or the Upper Limit of Normal (ULN). Marker elevation is defined as troponin > ULN/MI decision limit. If troponin is not done or not available, then CK-MB > ULN will qualify. If both troponin and CK-MB are not done or not available, then CK > 2 x ULN will qualify.

Secondary Definition: Preferentially uses a troponin threshold reported by the manufacturer, namely, the manufacturer 99th percentile. Marker elevation is defined as troponin > 99th percentile. If the troponin 99th percentile is not reported, then troponin > ULN will qualify. If troponin is not done or not available, then CK-MB > ULN will qualify. If both troponin and CK-MB are not done or not available, then CK > 2 x ULN will qualify.

Spontaneous MI ECG Criteria
ECG criterion is considered to be met if any of the following:

ST elevation: New ST elevation at the J-point in two contiguous leads with the cutpoints: ≥ 0.2 mV in men >age 40 and ≥ 0.25mV in men <40 years or ≥ 0.15 mV in women in leads V2–V3 and/or ≥ 0.1 mV in other leads, or new LBBB.

Any new Q-wave in leads V2–V3 ≥ 0.02 seconds or QS complex in leads V2 and V3 or Q-wave ≥ 0.03 seconds and ≥ 0.1 mV deep or QS complex in leads I, II, aVL, aVF, or V4–V6 in any two leads of a contiguous lead grouping (I, aVL, V6; V4–V6; II, III, and aVF) or R-wave ≥ 0.04 seconds in V1–V2 and R/S ≥ 1 with a concordant positive T- wave in the absence of a conduction defect.

ST depression and/or T-wave changes, new horizontal or down-sloping ST depression ≥ 0.05 mV in two contiguous leads; and/or T-wave inversion ≥ 0.1 mV in two contiguous leads. The ST-T wave criteria only apply in the absence of findings that would preclude ECG analysis such as LBBB, LVH with repolarization abnormalities, pre-excitation and pacemakers.

Silent MI
This event includes evidence of new silent Q-wave MI detected during routine protocol or clinically obtained ECG follow-up. Silent MI events will be classified as a type 1 MI.

Sudden death MI (Type 3)
MI events in which a presentation consistent with infarction is present but the patient dies before the biomarkers are drawn or within the first few hours of the event before the biomarkers become positive. Sudden unexpected cardiac death, including cardiac arrest, often with symptoms suggestive of myocardial ischemia, accompanied by presumably new ST-segment elevation, or new LBBB, or evidence of fresh thrombus in a coronary artery by angiography and/or at autopsy, but death occurring before blood samples could be obtained, or at a time before the appearance of cardiac biomarkers in the blood.

PCI-Related MI (Type 4a)
Primary Definition
CK-MB is the preferred biomarker and takes precedence over troponin. For subjects with normal baseline biomarker level pre-PCI, peri-PCI MI requires a rise in CK-MB to

>5-fold the ULN (or a rise in troponin to >35 times the MI Decision Limit/ULN, when CK- MB is unavailable) within 48 hours post-PCI. If pre-PCI cardiac markers (CKMB or cTn) are elevated, they must be stable or falling as indicated by two samples at least 6 h apart. The post-PCI CKMB level should reflect a rise of >20% over pre-PCI levels. In addition to biomarker criteria, peri-PCI MI requires at least one of the following:

- Post- procedure angiographic TIMI 0/1 flow in a major coronary artery or a side branch with reference vessel diameter ≥2.0 mm which had TIMI 2-3 flow at baseline, or TIMI 2 flow in a major coronary artery or a side branch with reference vessel diameter ≥3.0 mm which had TIMI 3 flow at baseline or Type C dissection (NHLBI classification) or greater in the target vessel.
- New ECG changes (ST segment elevation or depression >0.1mV in 2 contiguous leads), new pathologic Q-waves in ≥2 contiguous leads, or new persistent LBBB present on a post-PCI ECG obtained at least 30 minutes and up to 48 hours post procedure in the absence of any intervening coronary event between the time of the PCI procedure and the ECG showing changes.

NOTE: A type 4a MI will be diagnosed with a rise in CK-MB to >10-fold the ULN (or when CK-MB is unavailable, a rise in troponin to >70 times the MI Decision Limit/ULN) as a stand-alone criterion. If biomarkers are missing, a type 4a MI will be diagnosed if BOTH ECG criteria (new ST elevation or depression, Q-wave criteria, or new and persistent LBBB) AND angiographic criteria above are present. If pre-PCI cardiac markers are missing, they will be assumed to be normal in those without a preceding event.

Secondary Definition
Elevation of troponin values >5 X 99th percentile URL within 48 hours post-PCIin patients with normal baseline troponin values pre-PCI AND a rise of troponin values >20% if the baseline values are elevated pre-PCI and are stable or falling. If the troponin 99th percentile is not available, the MI Decision Limit / ULN may be used. If troponins are not available, CKMB elevation >5 X ULN will be used.

In addition to biomarker criteria, peri-PCI MI requires at least one of the following:

- Symptoms suggestive of myocardial ischemia (≥20 min)
- New ischemic ST changes or new pathological Q waves. (see "ECG Criteria" above) Note the UMI definition uses ≥0.05 mV of STD whereas the ISCHEMIA definition uses ≥ 0.1mV for PCI related ECG criteria
- Angiographic evidence of a flow limiting complication, such as loss of patency of a side branch, persistent slow-flow or no re-flow, embolization, or Type C dissection (NHLBI classification) or greater in the target vessel.
- Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality.

NOTE: A type 4a MI will be diagnosed with a rise in troponin to >70 times the 99th percentile URL (or, when troponin is unavailable, a rise in CK-MB to >10 times the ULN) as a stand-alone criterion. If biomarkers are missing, a type 4a MI will be diagnosed if BOTH ECG criteria (new ST elevation or depression, Q-wave criteria, or new and persistent LBBB) AND angiographic criteria above are present. If pre- PCI cardiac markers are missing, they will be assumed to be normal in those without a preceding event.

CABG-Related MI (Type 5)
Primary Definition
CK-MB is the preferred serum biomarker and takes precedence over cardiac troponin. For subjects with normal baseline biomarker level pre-CABG, peri-CABG MI requires a rise in CK-MB to >10-fold the ULN (or a rise in troponin to >70 times MI Decision Limit/ULN when CK-MB is

unavailable) within 48 hrs post-CABG. In addition to biomarker criteria, peri-CABG MI requires at least one of the following:

- A new substantial wall motion abnormality by cardiac imaging (CEC assessed), except new septal and apical abnormalities. The CEC will have latitude in determining whether a new wall motion abnormality is "substantial" in the context of the clinical event.
- New pathologic Q-waves in ≥2 contiguous leads or new persistent LBBB is present on post CABG ECG obtained day 3 post CABG, or hospital discharge, whichever comes earlier in the absence of any intervening coronary event between the time of the CABG procedure and the ECG showing changes.

NOTE: A type 5 MI will be diagnosed with a rise in CK-MB to >15-fold the ULN (or when CK-MB is unavailable a rise in troponin to >100 times the MI Decision Limit/ULN) as a stand-alone criterion. If biomarkers are missing, an MI will be diagnosed if the ECG criteria (New pathologic Q waves or new persistent LBBB) AND new substantial wall motion abnormality are BOTH present. If pre-CABG cardiac markers are missing, they will be assumed to be normal in those without a preceding event.

Secondary Definition
Elevation of troponin values >10 X 99th percentile URL within 48 hrs post-CABG in patients with normal baseline troponin values (≤ 99th percentile URL). If the troponin 99th percentile is not available, the ULN may be used. If troponins are not available, CKMB elevation >10 X ULN will be used. In addition to biomarker criteria, peri-CABG MI requires at least one of the following:

- New pathologic Q waves or new LBBB
- Angiographic evidence of new graft or new native coronary artery occlusion.
- Imaging evidence of new loss of viable myocardium.

NOTE: A type 5 MI will be diagnosed with a rise in troponin to >100 times the 99th percentile URL (or when troponin is unavailable a rise in CK-MB to >15 times the ULN) as a stand-alone criterion. If biomarkers are missing, an MI will be diagnosed if the ECG criteria (New pathologic Q waves or new persistent LBBB) AND new substantial wall motion abnormality are BOTH present. If pre-CABG cardiac markers are missing, they will be assumed to be normal in those without a preceding event.

Complicated MI and Large MI
Complicated MI: Prognostically important MIs may also be identified as those with complications such as hemodynamic instability, cardiogenic shock, drop in EF >10% from baseline, electrical instability with life-threatening VT or VF, or heart failure complicating MI. Complicated myocardial infarctions may typically require ICU care, invasive support (eg. intubation, IABP, PA catheters) and intravenous medications (eg. inotropes or antiarrhythmics.) CEC adjudicators will identify complicated MIs based upon the information available to them in the eCRF and source documents.

- Hemodynamic instability: requiring fluids, inotropic or vasopressor support to maintain end-organ perfusion. May progress to shock if also accompanied by end-organ underperfusion.
- Shock: Compromise of end-organ perfusion due to hemodynamic instability and sustained hypotension. Often manifested by hypotension, increased creatinine, shock liver, and decreased mentation.
- Life-threatening VT or VF: Requiring antiarrhythmics or defibrillation to return sinus rhythm. Transient runs of VT (eg. during reperfusion) are not associated with hemodynamic instability are not usually considered life-threatening.
- Decreased EF ≥ 10%: EF assessment during the event which indicates a drop from prior assessments (eg. EF 30% from previous EF 55%)

- HF in the setting of an MI is defined on the basis of the physician's decision to treat HF with an intravenous (IV) diuretic, IV inotropic agent or IV vasodilator and at least 1 of the following:
    - Presence of pulmonary edema or pulmonary vascular congestion on chest radiograph believed to be of cardiac cause.
    - Rales greater than 1/3 up the lung fields believed to be due to HF.
    - Pulmonary Capillary Wedge Pressure (PCWP) or left ventricular end diastolic pressure (LVEDP) greater than 18 mmHg.
    - Dyspnea, with documented paO2 less than 80 mmHg on room air or O2 saturation less than 90% on room air, without significant lung disease

Large MI: The size of MI will be assessed by examining peak levels of cardiac biomarkers as a continuous function.

Hospitalization for Unstable Angina

Prolonged ischemic symptoms at rest (usually ≥10 minutes in duration), or accelerating pattern of chest pain that occurs with a lower activity threshold (CCS class III or IV) considered to be myocardial ischemia upon final diagnosis resulting in an unscheduled visit to a healthcare facility resulting in an overnight stay generally within 24 hours of the most recent symptoms, cardiac biomarkers not meeting MI criteria, and at least one of the following:

- New or worsening ST or T wave changes on resting ECG* (core laboratory assessed)
- Angiographic evidence of a ruptured/ulcerated plaque, or thrombus in an epicardial coronary artery believed to be responsible for the ischemic symptoms/signs (core laboratory assessed).

*ECG Criteria:
ST segment shifts and T-wave changes: New horizontal or down-sloping ST depression ≥0.05 mV in two contiguous leads; and/or T inversion ≥0.1 mV in two contiguous leads, or new ST segment elevation ≥0.1mV in 2 contiguous leads. The ST-T wave criteria only apply in the absence of findings that would preclude ECG analysis such as LBBB, LVH with repolarization abnormalities, pre-excitation and pacemakers.

Resuscitated Cardiac Arrest

Resuscitated cardiac arrest is defined as successful resuscitation for documented cardiac arrest out-of-hospital (or ER) in a patient subsequently admitted to hospital, and then discharged. A patient who is successfully resuscitated but dies before hospital discharge of complications related to the cardiac arrest (e.g., anoxic encephalopathy, septic shock), will be classified as a coronary heart disease death. An uncomplicated procedure-related cardiac arrest with prompt resuscitation and without adverse sequelae will not be counted as an event. Events that meet the MI criteria will be categorized as MI.

Hospitalization for Heart Failure

While patients may have multiple simultaneous disease processes, for the end point event of heart failure requiring hospitalization, the diagnosis of congestive heart failure would need to be the primary process. Heart failure (HF) requiring hospitalization is defined as an event that meets the following criteria:

a. Requires hospitalization defined as an admission to an inpatient unit or a visit to an emergency department that result in at least a 24 hour stay (or a date change if the time of admission/discharge is not available).

AND

b. Clinical symptoms of heart failure, including at least one of the following: New or worsening
   - Dyspnea
   - Orthopnea
   - Paroxysmal nocturnal dyspnea
   - increasing fatigue/worsening exercise tolerance

AND

c. Physical signs of heart failure, including at least two of the following:
   1. Edema (> 2+ lower extremity)
   2. Pulmonary rales (pulmonary edema not occurring as the consequence of an arrhythmia in the absence of worsening heart failure. If pulmonary edema complicates acute MI event should be coded as MI)
   3. Jugular venous distension
   4. Tachypnea (respiratory rate > 20 breaths/minute)
   5. Rapid weight gain
   6. S3 gallop
   7. Increasing abdominal distension or ascites
   8. Hepatojugular reflux
   9. Radiological evidence of worsening heart failure
   10. A right heart catheterization within 24 hours of admission showing a pulmonary capillary wedge pressure (pulmonary artery occlusion pressure) ≥ 18 mm Hg and/or a cardiac output < 2.2 L/min/m2

NOTE: Biomarker results (e.g., brain natriuretic peptide (BNP)> 500 or Pro-NT BNP > 2500) consistent with congestive heart failure will be supportive of this diagnosis, but the elevation in BNP cannot be due to other conditions such as cor pulmonale, pulmonary embolus, primary pulmonary hypertension, or congenital heart disease. Increasing levels of BNP, although not exceeding the ULN, may also be supportive of the diagnosis of congestive heart failure in selected cases (e.g. morbid obesity).

AND

d. Need for additional/increased therapy
   Initiation of, or an increase in, treatment directed at heart failure or occurring in a patient already receiving maximal therapy for heart failure and including at least one of the following:
   1. Initiation of or a significant augmentation in oral therapy for the treatment of congestive heart failure
   2. Initiation of intravenous diuretic, inotrope, or vasodilator therapy
   3. Uptitration of intravenous therapy, if already on therapy
   4. Initiation of mechanical or surgical intervention (mechanical circulatory support, heart transplantation or ventricular pacing to improve cardiac function), or the use of ultrafiltration, hemofiltration, or dialysis that is specifically directed at treatment of heart failure.

AND

e. No other non-cardiac etiology (such as chronic obstructive pulmonary disease, hepatic cirrhosis, acute renal failure, or venous insufficiency) and no other cardiac etiology (such as pulmonary embolus, cor pulmonale, primary pulmonary hypertension, or congenital heart disease) for signs or symptoms are identified.

Stroke

Stroke is defined as the rapid onset of a new neurologic deficit attributed to an obstruction in cerebral blood flow and/or cerebral hemorrhage with no apparent non-vascular cause (eg. trauma, tumor, or infection). Available neuroimaging studies will be considered to support the clinical impression and to determine if there is a demonstrable lesion compatible with an acute stroke.

Classification:

Transient Ischemic Attack
A Transient Ischemic Attack is defined as an acute episode of focal cerebral, spinal, or retinal dysfunction caused by an ischemia of central nervous system tissue which resolves within 24 hrs and without neuroimaging evidence of acute infarction.

Ischemic Stroke
Ischemic stroke is defined as an acute episode of focal cerebral, spinal, or retinal dysfunction caused by an infarction of central nervous system tissue.

Signs/ symptoms ≥ 24 hrs regardless of neuroimaging findings:
Ischemic stroke can be defined clinically- by persistence of signs and symptoms ≥ 24 hrs, usually supported by evidence of infarction on neuroimaging (CT or MRI) although very early neuroimaging (usually with CT) may not demonstrate the infarction.

Signs/ symptoms < 24 hrs with neuroimaging evidence of infarction:
Ischemic stroke can be defined by neuroimaging- where neuroimaging (usually MRI diffusion weighted or flair images) confirms the presence of acute infarction even if signs/ symptoms resolve within 24 hrs.

Patients admitted for an acute stroke treated with thrombolysis or interventions that have no residual neurologic symptoms after treatment will be classified as an ischemic stroke.

Ischemic Stroke with Symptomatic Hemorrhagic Conversion
Hemorrhagic conversion may be a consequence of ischemic stroke and may be symptomatic, resulting in neurologic deterioration, or asymptomatic. Symptomatic Hemorrhagic Conversion is defined neuroimaging evidence of hemorrhage within the area of infarction associated with clinical deterioration (eg. increase in NIHSS of ≥ 4 points) or death, symptoms to hemorrhage related mass effect, or symptoms out of proportion to what would be expected from the ischemic stroke or cerebral edema alone. When an Ischemic Stroke with Symptomatic Hemorrhagic Conversion is identified, the date and time of stroke onset will refer to the first onset of the Ischemic Stroke and will not be counted as two events.

Hemorrhagic Stroke
Hemorrhagic stroke is defined as an acute episode of focal or global cerebral or spinal dysfunction caused by a non-traumatic intraparenchymal, intraventricular, or subarachnoid hemorrhage.

Undetermined- or Uncertain type- of Stroke
Undetermined stroke is defined as a stroke with insufficient information to allow categorization as Ischemic Stroke or Hemorrhagic Stroke. If possible, speculate on the stroke subtype and note in Comments. This is not to signify an indeterminate event where there is insufficient evidence to suspect a stroke had occurred.

eTable 5. Committee Members and Key Personnel

National Heart, Lung, and Blood Institute
Jerome L. Fleg, Project Officer
Ruth Kirby

ISCHEMIA-CKD Clinical Coordinating Center (CCC)*

Study Leadership
Sripal Bangalore (Principal Investigator)

CCC Faculty
Judith S. Hochman (ISCHEMIA trial Chair)
David J. Maron (ISCHEMIA trial Co-Chair)
Jeffrey Berger (Director of the Biorepository, ISCHEMIA Regional Leader)
Roy Mathew (Country Lead Nephrologist for US)
Jonathan Newman (ISCHEMIA Regional Leader)
Harmony R. Reynolds (ISCHEMIA Regional Leader)
Mandeep Sidhu (US-VA Regional Co-Leader)

Program Director
Stephanie Mavromichalis

Project Managers
Gia Cobb
Stephanie Ferket**
Andre Gabriel**

Clinical Research Associates
Diana Cukali
Kevin McMahon**

Clinical Trial Assistants
Ahmed Ayoub
Matthew Shinseki**
Paula Wilson
Solomon Yakubov**

Data Analyst
Mark Xavier

**see ISCHEMIA Trial Design Manuscript for complete listing*

***past members*

ISCHEMIA Statistical and Data Coordinating Center, Duke Clinical Research Institute
Sean O' Brien, Principal Investigator
See ISCHEMIA Trial Design Manuscript for complete listing

ISCHEMIA-CKD Committee Members

Steering Committee

Sripal Bangalore, Principal Investigator
Judith S. Hochman, ISCHEMIA trial Chair
David J. Maron, ISCHEMIA trial Co-Chair
Glenn M. Chertow, Nephrologist
William Boden, ISCHEMIA trial Co-PI
Bruce Ferguson, ISCHEMIA trial Co-PI
Robert Harrington, ISCHEMIA trial Co-PI
Gregg W. Stone, ISCHEMIA trial Co-PI
David O. Williams, ISCHEMIA trial Co-PI

Renal Committee

Charles A. Herzog (Chair)
Sripal Bangalore
Carlo Briguori
David M. Charytan
Glenn M. Chertow
Jerome Fleg
Peter A. McCullough
Roxana Mehran
Ruth Kirby

Publications Committee

Sripal Bangalore (Chair)
Karen Alexander
Jerome Fleg
Judith S. Hochman
David J. Maron
Roy Mathew
Sean M. O'Brien
Harmony R. Reynolds
Mandeep Sidhu

Optimal Medical Therapy Committee

Same as the ISCHEMIA trial (See ISCHEMIA Trial Design Manuscript for complete listing)

Optimal Revascularization Therapy Planning Committee

Same as the ISCHEMIA trial (See ISCHEMIA Trial Design Manuscript for complete listing)

Clinical Event Review Committee

Same as the ISCHEMIA trial (See ISCHEMIA Trial Design Manuscript for complete listing)

BioRepository Committee

Same as the ISCHEMIA trial (See ISCHEMIA Trial Design Manuscript for complete listing)

EQOL Committee
Same as the ISCHEMIA trial (See ISCHEMIA Trial Design Manuscript for complete listing)

Recruitment for Women & Minorities
Same as the ISCHEMIA trial (See ISCHEMIA Trial Design Manuscript for complete listing)

DSMB Members
Same as the ISCHEMIA trial (See ISCHEMIA Trial Design Manuscript for complete listing)

Independent Statistical Analysis Center for DSMB Reporting
Same as the ISCHEMIA trial (See ISCHEMIA Trial Design Manuscript for complete listing)

ECG/ETT Core Lab
Same as the ISCHEMIA trial (See ISCHEMIA Trial Design Manuscript for complete listing)

Angiographic Core Lab
Same as the ISCHEMIA trial (See ISCHEMIA Trial Design Manuscript for complete listing)

Academic Research Organizations (AROs)
Same as the ISCHEMIA trial (See ISCHEMIA Trial Design Manuscript for complete listing)

Contract Research Organizations (CROs)
Same as the ISCHEMIA trial (See ISCHEMIA Trial Design Manuscript for complete listing)

eTable 6. Site Listing

Country (No.Randomizations)	Investigator(s)	Study Coordinator(s)	City & State (if applicable)	Institution (No. Randomizations)
United States (159)				
Lead Country Nephrologist				
Roy Mathew, MD	Mayil S. Krishnam, MD Jeffrey C. Milliken, MD Pranav M. Patel, MD Arnold H. Seto, MD Kevin T. Harley, MD (N) Michael A. Gibson, MD Byron J. Allen, MD Wei Ling Lau, MD (N)	Shirin Heydari, MS Edgar Karanjah, MD Wanda C. Marfori, MD Eduardo Hernandez-Rangel, MD Pam Singh	Orange, CA	University of California Irvine Medical Center (23)
	Patricia Pellikka, MD LaTonya J. Hickson, MD (N)	Gaylin Petty, CVT Susan K. Milbrandt Dawn D. Shelstad	Rochester, MN	Mayo Clinic (16)
	Harmony R. Reynolds, MD Jonathan D. Newman, MD, MPH Sripal Bangalore, MD, MHA Lawrence M. Phillips, MD Muhamed Saric, MD Olga Zhdanova, MD (N)	Stanley E. Cobos, BA Kirsten J. Quiles, MS Raven R. Dwyer, MPH Dalisa Espinosa, MBS	New York, NY	NYU Langone Medical Center-Bellevue Hospital (15)
	Kreton Mavromatis, MD Jason Linefsky, MD Harold Franch, MD (N)	John Doan, MD Raven Lee, CCRP Risha Patel	Decatur, GA	Atlanta VA Medical Center (13)
	Anjali Acharya, MD (N) Seth Sokol, MD Jay Meisner, MD Amit Kakkar, MD Tarek Rashid, MD Hatem Elabd, MD	Jeanne Russo, RN Cidney Schultz, RN	Bronx, NY	Jacobi Medical Center (12)
	Charles Herzog, MD Mengistu Simegn, MD	Shari Mackedanz Barbara Wicklund	Minneapolis, MN	Hennepin County Medical Center (9)
	Salvatore P. Costa, MD Terrance Welch, MD Michael Chobanian, MD (N)	Henry C. Stokes, RN Gaylin Petty, CVT	Lebanon, NH	Dartmouth Hitchcock Medical Center (7)
	Subhash Banerjee, MD	Preeti Kamath, BDS, MHA, CCRP Ishita Tejani, BDS, MS, MSPH	Dallas, TX	V.A. North Texas Health Care System (6)
	Adedayo Adeboye, MD Roy Mathew, MD (N)	Amy Flowers Kathryn Mason Anjana Rishmawi	Columbia, SC	William Jennings Bryan Dorn V.A. Medical Center (5)
	Sudhanva S. Hegde, MD	Stanley E. Cobos, BA Raven R. Dwyer, MPH Dalisa Espinosa, MBS Kirsten J. Quiles, MS Carolyn J. Gruber, PA-C Noelle M. Durfee, MS PA-C	Brooklyn, NY	Kings County Hospital Center (9)
	Khaled Abdul-Nour, MD Lalathaksha Kumbar, MD (N) Jerry Yee, MD (N)	Heather Golden Naima L. Ogletree, DNP, APRN-BC Schawana Thaxton, DNP, NP-C	Detroit, MI	Henry Ford Health System (4)
	Alec Moorman, MD Bilal Malik, MD (N)	Fatima Ranjbaran, RN Bryn Smith, BS	Seattle, WA	University of Washington Medical Center (4)

	Carly Ohmart		
Radmilar Lyubarova, MD Mohammad El-Hajjar, MD Mandeep S. Sidhu, MD, MBA Steven A. Fein, MD Mikhail T. Torosoff, MD, PhD Radmila Lyubarova, MD Sulagna Mookherjee, MD Krzysztof Drzymalski, MD Rafia Chaudhry, MD (N) Krishnakumar Hongalgi, MD (N) Arif Asif, MD (N)(2012-2015) Loay Salman, MD (N)(2015-2018)	Wendy L. Stewart, MS Kristin M. Salmi, BS	Albany, NY	Albany Medical Center Hospital (3)
Patricia K. Nguyen, MD Yiming Lit, MD (N)	Davis Vo, BS James Hirsch, BS	Palo Alto, CA	VA Palo Alto Healthcare System (3)
Steven P. Sedlis, MD Robert M. Donnino, MD Jeffrey Lorin, MD David Goldfarb, MD (N)	Leandro C. Maranan, CCRC	New York, NY	VA New York Harbor Health Care System (3)
Mohammad El-Hajjar, MD Paul Der Mesropian, MD (N) Joseph Sacco, MD Naveed Akhtar, MD Maris Orgera, MD Mandeep S. Sidhu, MD, MBA (2012-2016) Roy Mathew, MD (N) (2012-2015) Elvira Gosmanova, MD (N) (2015-2018)	Jennifer Thomson, MA	Albany, NY	Samuel Stratton VA Medical Center of Albany NY (2)
Fadi Hage, MD Dana Rizk, MD (N) James E. Davies, MD Massoud Leesar, MD Jaekyeong Heo, MD Amy Iskandrian, MD Firas Al Solaiman, MD Satinder Singh, MD	Badhma Valaiyapathi, MD	Birmingham, AL	UAB Vascular Biology and Hypertension Program (2)
Peter H. Stone, MD David Charytan, MD (N)	Hermine Osseni, MS Charlene Wiyarand (BS) Peter Douglass, BA Hayley Pomeroy, BA Alexandra Craft, BA Bethany Harvey, BA	Boston, MA	Brigham & Women's Hospital, Harvard Medical School (2)
Kevin Marzo, MD Juan Gaztanaga, MD Shayan Shirazian, MD (N)	Wendy Drewes, RN Dipti Patel, RN	Mineola, NY	NYU Winthrop (2)
Lekshmi Dharmarajan, MD	Jenne M. Jose, PA Stanley E. Cobos, BA Raven R. Dwyer, MPH Kirsten J. Quiles, MS	Bronx, NY	NYU-HHC Lincoln Medical and Mental Health Center (2)
Janani Rangaswami, MD (N) Christian Witzke, MD Gregg Pressman, MD	Rachel Murphy, BS Kinnari Murphy, MPH	Philadelphia, PA	Albert Einstein Medical Center (2)
John B. Kostis, MD Abel E. Moreyra, MD Jonathan Lebowitz, MD (N)	Nora M. Cosgrove, RN	New Brunswick, NJ	Cardiovascular Institute, Rutgers RWJ Medical School (1)

Ellis W. Lader, MD Beth Stefanchik, MD (N)	Martha Meyer, RN, MSN	Kingston, NY	Mid Valley Cardiology (1)
Sampoornima Setty, MD Balaji Srinivasan, MD (N)	Kimberly E. Halverson, RHIT Christine Roraff, RN Jonean Thorsen, RN	La Crosse, WI	Gundersen Lutheran Medical Center (1)
Rita Coram, MD	Anne Marie Webb, BSN Ellie Fridell, BS Heidi Wilson, BS	Louisville, KY	University of Louisville (1)
David Booth, MD John Kotter, MD Ahmed Abdel-Latif, MD, PhD Sadiq Ahmed, MD (N)	Yvonne Taul, RN Caroline Rodgers, RN Jennifer Isaacs, MS Viktoria Bulkley, RN Laura True, RN Alexandra Hunter, MPH	Lexington, KY	Lexington VA Medical Center (1)
Michelle Ratliff, MD Karen Servilla, MD (N)	Robyn Elliott Jennifer Hogan	Albuquerque, NM	New Mexico V.A. Healthcare System (1)
James J. Jang, MD Gennie Yee, MD Deepa Ramaswamy, MD (N)	Olivia Anaya	San Jose, CA	Kaiser Permanente San Jose (1)
Michel Georges Khouri, MD John Middleton, MD (N)	Kristine Arges Melissa LeFevre Jennifer Tomfohr	Durham, NC	Duke University Medical Center (1)
Jason T. Call, MD David Sisson, MD (N)	Stephanie, M. Lane, RN, BSN, CCRN Jennifer L. Stanford, RN, MSN	Winchester, VA	Winchester Cardiology and Vascular Medicine, PC (1)
Prakash Deedwania, MD Kiran Reddy, MD Mei Hwang, MD (N)	Antonia Vega	Fresno, CA	UCSF - Fresno Community Regional Medical Center (1)
Steven Weitz, MD Page Salanger, MD (N)	Steven Giovannone Lori Pritchard, RN	Schenectady, NY	Cardiology Associates of Schenectady P.C. (1)
Ray Wyman, MD	Joy Burkhardt, CCRP Suellen Hosino, RN, BSN, CCRP	Torrance, CA	Torrance Memorial Medical Center (1)
Khaled Dajani, MD Holly Mattix-Kramer, MD (N) Verghese Mathew, MD	Carol M. Kartje, BSN	Maywood, IL	Loyola University Medical Center (1)
Michael D. Shapiro, DO Jose Rueda, MD (N)	Aynun Naher, MBBS, MS David Schlichting, LPN	Portland, OR	Oregon Health & Science University (1)
Omar Almousalli, MD John Lehman, MD Norbert Urbanski, MD	Elizabeth Capasso-Gulve Alaine Melanie Loehr Marlowe Mosley	Fairview Heights, IL	Advanced Heart Care Group / MEDICORICIUM, L.L.C. (1)

Russia (111)

Lead Country Cardiologist
Olga Bockeria, MD, PhD
Lead Country Nephrologist
Evgeny Shutov, MD

Alexander M. Chernyavskiy, MD, PhD Evgeniy I. Kretov, MD Igor O. Grazhdankin, MD Alexander Sergeevich Borisov, MD (N)	Ivan A. Naryshkin, MD	Novosibirsk	E. Meshalkin National Medical Research Center of the Ministry of Health of the Russian Federation (73)
Leo A. Bockeria, MD, PhD Karen Petrosyan, MD, PhD Evgeny Shutov, MD (N)	Olga Bockeria, MD, PhD Zalina Kudzoeva, MD	Moscow	National Medical Research Center for Cardiovascuar Surgery (34)
Leonid L. Bershtein, MD, PhD Sergey A. Sayganov, MD, PhD	Irina Subbotina Victoria Gumerova	Saint Petersburg	North-Western State Medical University (4)

	Anastasia M. Kuzmina-Krutetskaya, MD Elizaveta V. Zbyshevskaya, MD, PhD Nana O. Katamadze, MD, PhD Vladimir Ryasniansky, MD (N)			
Poland (105) Lead Country Cardiologists Radoslaw Pracon, MD, PhD Marcin Demkow, MD, PhD Lead Country Nephrologist Robert Malecki, MD				
	Tomasz Mazurek, MD, PhD Karolina Wojtera, MD Anna Fojt, MD Ewa Szczerba, MD	Jakub Maksym, MD	Warszawa	Medical University of Warsaw (57)
	Piotr Pruszczyk, MD, PhD Marek Roik, MD, PhD	Andrzej Łabyk, MD Agnieszka Szramowska, MD Olga Zdończyk, MD	Warszawa	Department of Internal Medicine and Cardiology, Infant Jesus Teaching Hospital, Medical University of Warsaw (22)
	Marcin Demkow, MD, PhD Radoslaw Pracon, MD, PhD Cezary Kepka, MD PhD Anna Teresinska, MD PhD Karolina Kryczka, MD PhD Jan Henzel, MD PhD Mateusz Solecki, MD PhD Edyta Kaczmarska, MD PhD Robert Malecki, MD (N)	Olga Walesiak Katarzyna Malinowska	Warsaw	Coronary and Structural Heart Diseases Department, Institute of Cardiology (19)
	Jaroslaw Drozdz, PhD Bartosz Czarniak, MD Malgorzata Frach (formerly Stasiak), MD Konrad Szymczyk, MD Iwona Niedzwiecka, MD Sebastian Sobczak, MD Tomasz Ciurus, MD Piotr Jakubowski, MD Magdalena Misztal-Teodorczyk, MD Dawid Teodorczyk, MD Aleksandra Fratczak, MD Marcin Szkopiak, MD Patrycja Lebioda, MD Michal Wlodarczyk, MD Anna Plachcinska, MD Jacek Kusmierek, MD Magdalena Miller, MD Halina Marciniak, MD Karolina Wojtczak-Soska, MD Katarzyna Łuczak, MD Tomasz Tarchalski, MD Anna Cichocka-Radwan, MD	Marta Swiderek, MA Ewelina Wojtala, MA	Lodz	Cardiology Clinic, Medical University in Lodz (7)
India (92) Lead Country Cardiology Balram Bhargava, DM Lead Country Nephrologist Sandeep Mahajan, MD				
	Sajeev Chakanalil Govindan, MD, DNB, DM, PhD	Anjali Anand, MSc	Calicut	Government Medical College (23)

Rajesh Gopalan Nair, MD, DNB, DM Melemadathil Srilatha, MD , DM (N)	Janitha Raj, B.Tech Reshma Ravindran, MSc Rajalekshmi VS, MSc, MScCRRA		
Atul Mathur, MD Upendra Kaul, MD Sanjeev Gulati MD, DM (N)	Ajit Singh Narula, MD Vijay Kher, MD Puneet Sodhi, MD	New Delhi	Fortis Escort Heart Institute (13)
Anoop Mathew, MD Eapen Punnoose, MD TA Kishore, MD (N) Satish Sankaranarayanan, MD (N)	Binoy Mannekkattukudy Kurian	Kolenchery	MOSC Medical College Hospital (12)
Ranjan Kachru, MD Sanjeev Gulati, MD (N)	Abhishek Dubey, PGDACR	New Delhi	Fortis Healthcare H.t Lt. Rajan Dhall Hospital (11)
Balram Bhargava, DM Sandeep Mahajan, MD (N) G.Karthikeyan, DM S.Ramakrishnan, DM Sandeep Seth, DM Rakesh Yadav, DM Sandeep Singh, DM Ambuj Roy , DM Neeraj Parakh, DM Sunil Kumar Verma, DM Rajiv Narang, DM Sundeep Mishra, DM Nitish Naik, DM Gautam Sharma, DM Shiv Kumar Choudhary, M.Ch Chetan Patel, DNB Gurpreet Gulati, MD Sanjeev Sharma, MD V K Bahl, DM	Chandini Suvarna, BDS	New Delhi	All India Institute Of Medical Sciences (8)
Neeraj Pandit, MD, DM Ajay Sharma, MD, DM Niruta Sharma MD Hemant Shakhar Mahapatra MD	Sheromani Bajaj Vandana Yadav, Msc, PGDACR Girish Mishra, Msc, PGDACR	New Delhi	Dr Ram Manohar Lohia Hospital (5)
Cholenahally Nanjappa Manjunath, MD, DM Nagaraja Moorthy , MD, DM Satvic Cholenahally Manjunath, MD, DM Suryaprakash Narayanappa, MBBS Umesh Lingaraj, MD (N) Veerabhadra Gupta, MD (N)	Nandita Nataraj, BE(Biotech) PGDICRCDM Soundarya Nayak, BE(Biotech) PGDICRCDM Mahevamma Mylarappa, GNM (General Nursing)	Bengaluru	Sri Jayadeva Institute of Cardiovascular Sciences and Research (4)
Milind Avdhoot Gadkari, MD Siddharth Gadage, MD DNB Tapan Umesh Pillay, BHMS MSc Valentine Lobo, MD (N)	Sheetal Rupesh Karwa, BHMS Suvarna Kolhe, MSc	Pune	KEM Hospital Pune (4)
Johann Christopher, MD, DNB Nirmal Kumar, MD, DM Suresh Kumar, MD, DM (N)	K. Manjula Rani, MSc. M. Sowjanya Reddy, BSc K. Preethi, BSc	Hyderabad	Gurunanak CARE Hospital (3)
John Jose, MD Vinoi George David, MD (N)	Anu Tharini Anandaroop Lahiri	Vellore	Christian Medical College (3)
Gurpreet S. Wander, DM Rohit Tandon, MD	Baljeet Kaur, MSc (Biotechnology) Sonika Gupta, MBA, B. Pharmacy	Ludhiana	Hero DMC Heart Institute, Dayanand Medical College and Hospital (2)

	Sarju Ralhan, M.Ch (CTVS) Naved Aslam, DM Abhishek Goyal, DM Vikas Makkar, DM (N)			
	S.K. Dwivedi, DM V.S. Narain, DM Sharad Chandra, DM	Roma Tewari, PG Meenakshi Mishra, PG Shivali Patel Suman Singh, PG	Lucknow	King George's Medical University, Department of Cardiology (2)
	Johann Christopher, MD Praneeth Polamuri, MD Vikranth Reddy, MD, DNB (N)	Sowjanya Reddy Manjula Rani	Hyderabad	CARE Hospital (1)
	Upendra Kaul, MD	Priyadarshani Arambam Bebek Singh	New Delhi	Batra Hospital and Medical Research Centre (BHMRC) (1)
China (70) Lead Country Cardiologist Lixin Jiang, MD, PhD Lead Country Nephrologists Xuemei Li, MD				
	Hong Cheng, MD Weijing Bian, MD Guoqin Wang , MD	Jing Dong, MD Xiaoyi Xu, MD	Beijing	Beijing Anzhen Hospital (24)
	Jiyan Chen, MD Zhiming Ye, MD (N)	Haojian Dong Peiyu He Chunli Xia Junqing Yang Qi Zhong	Guangzhou	Guangdong General Hospital (15)
	Xin Fu, MD Zhangsuo Liu, MD (N)	Dan Gao Dengke Jiang Ran Leng Xutong Wang Qianqian Yuan Lili Zhang	Zhengzhou	The First Affiliated Hospital of Zhengzhou University (13)
	Shuyang Zhang, MD, PhD Zhenyu Liu, MD Xuemei Li, MD (N)	Ying Wang, MD Yechen Han, MM Lihong Xu, RN Zhenyu Liu Gang Chen, MD Rongrong Hu	Beijing	Peking Union Medical College Hospital (11)
	Yitong Ma, MD (N) Yining Yang, MD	Dongze Li Xiaomei Li Xiang Ma Zixiang Yu Qian Zhao	Urumqi	First Affiliated Hospital of Xinjiang Medical University (7)
Italy (62) Lead Country Cardiologist Francesco Orso, MD				
	Carlo Briguori, MD	Francesca De Micco	Naples	Clinica Mediterranea (52)
	Gian Piero Perna, MD Marco Marini, MD Gabriele Gabrielli, MD Mario D'arezzo, MD (N)	Francesca Pietrucci, PhD	Ancona	Cardiology and CCU - Ospedali Riuniti Ancona (7)
	Marco Sicuro, MD Valentina Pellu, MD (N)	Gianpiero Leone, MD Francesco Pisano, MD Cristina Bare, BSc	Aosta	Ospedale Regionale Umberto Parini (1)

	Paolo Calabro, MD Tiziana Formisano, MD Piero Tassinario, MD (N)	Fabio Fimiani	Napoli	AORN Dei Colli "V. Monaldi" UOC Cardiologia Università della Campania "L.Vanvitelli" (1)
	Marcello Galvani, MD Filippo Ottani, MD Marco De Fabritis, MD (N)	Chiara Attanasio	Forli	Ospedale "G.B. Morgagni – L. Pierantoni" Forli (AUSL della Romagna) (1)
Mexico (30) Lead Country Cardiologist Jorge Escobedo, MD Lead Country Nephrologist Magdelena Madero, MD				
	Juan Manuel López Quijano, MD, MSc Alejandro Chevaile Ramos, MD (N) Jorge Carrillo Calvillo, MD	Teresa Delgadillo	San Luis Potosi	Hospital Central Dr. Ignacio Morones Prieto (16)
	Jorge Escobedo, MD Rubén Baleón-Espinosa, MD Arturo S Campos-Santaolalla, MD Elihú Durán-Cortés, MD José M Flores-Palacios, MD Andrés García-Rincón, MD Moisés Jiménez-Santos, MD Joaquín V Peñafiel, MD José A Ortega-Ramírez, MD Aquiles Valdespino-Estrada, MD	Ramon de Jesús-Pérez, RN	Benito Juarez	Instituto Mexicano del Seguro Social (10)
	Erick Alexánderson Rosas, MD Magdalena Madero Rovalo, DM (N)	María Pérez García	Mexico City	Instituto Nacional de Cardiología "Ignacio Chávez" (2)
	Guillermo Garcia-Garcia (N) Jonathan S. Chavez-Iñiguez	Lorena Lopez, BS	Guadalajara	Hospital Civil de Guadalajara Fray Antonio Alcalde (2)
Canada (24) Lead Country Cardiologists Akshay Bagai, MD, MHS Kevin R. Bainey, MD, MSc Lead Country Nephrologist Ron Wald, MDCM, MPH				
	Kevin R. Bainey, MD, MSc Neesh Pannu, MD (N)	Norma Hogg, RN Suzanne Welsh, RN	Edmonton, AB	University of Alberta (15)
	Asim N. Cheema, MD, PhD Akshay Bagai, MD, MHS Ron Wald, MDCM, MPH (N) Shaun Goodman, MD, MSc John Joseph Graham, MRCP, MB ChB, BSc Mark Peterson, MD, FRCSC, PhD Chi-Ming Chow, MD, CM, MSc Beth Abramson, MD, MSc	Khrystyna Kushniriuk, HBSc, MD Mohammed Hussain Olugbenga Bello	Toronto, ON	St. Michael's Hospital (3)
	Graham Wong, MD Kenneth Gin, MD Christopher Fordyce, MD	Jackie Chow, BSN Andrew Starovoytov, MD Naomi Uchida, BSN Ngaire Meadows	Vancouver, BC	Vancouver General Hospital (2)
	Ariel Diaz, MD Philippe Rheault, MD Alejandro Gisbert, MD	Isabelle Roy, RN Patricia Alarie, RN Linda Arcand, RN	Trois-Rivieres, QC	Centre Hospitalier de Regional Trois-Rivieres (1)

	Alain Raymond, MD Yanek Pépin-Dubois, MD Miguel Barrero, MD Carl-Éric Gagné, MD Mark Garand, MD Ricardo Costa, MD Catherine Lemay, MD Ying Tung Sia, MD Pierre Gervais, MD Alain Rheault, MD	Estelle Montpetit		
	Pallav Garg, MBBS, MSc Matthew Weir, MD (N)	Sandy Carr, RN Catherine Bone, RN	London, ON	London Health Sciences Centre (1)
	Amar Uxa, MD Michael Farkouh, MD Christopher Chan, MD (N)	Nadia Asif Suzana Tavares	Toronto, ON	University Health Network (1)
	Philippe Généreux, MD Jean Diodati, MD François Madore, MD (N)	Chantale Mercure, RN	Montréal, QC	Centre Integre Universitaire De Sante et de Services Sociaux du Nord de l'île de Montréal /Hôpital du Scaré-Cœur de Montréal (1)
Singapore (14) Lead Country Cardiologist Kian-Keong Poh, MD Lead Country Nephrologist Titus Lau, MD				
	Kian-Keong Poh, MD Ping Chai, MD Titus Lau, MD (N) Joshua P. Loh, MD Edgar L. Tay, MD Kristine Teoh, MD Lynette L. Teo, MD Ching-Ching Ong, MD Raymond C. Wong, MD Poay-Huan Loh, MD Theodoros Kofidis, MD Wan Xian Chan, MD Koo Hui Chan, MD	Sik-Yin V Tan, BSc Winnie C Sia, BSc Audrey W Leong, BSc	Singapore	National University Heart Center Singapore (11)
	David Foo, MBBS Jason Loh Kwok Kong, MD Ching Min Er, MD Fahim Haider Jafary, MD Tracy Tan, MD (N)	Li Hai Yan, RN	Singapore	Tan Tock Seng Hospital (2)
	Terrance Chua, MD	Nasrul Ismail Min Tun Kyaw Deborah Yip	Singapore	National Heart Centre Singapore (1)
Brazil (13) Lead Country Cardiologist Renato D. Lopes, MD, PhD Lead Country Nephrologists Maria Eugenia Canziani, MD (Lead) Sergio Draibe, MD (Co-Lead)				
	Whady Hueb, MD Eduardo Gomes Lima, MD Paulo Cury Rezende, MD Expedito Eustáquio Ribeiro Silva, MD Alexandre Ciappina Hueb, MD	Myrthes Emy Takiuti, RN	Sao Paulo	Heart Institute (InCor) University of São Paulo (6)

	Marianna D. A. Dracoulakis, MD, PhD Rodolfo G. S. D Lima, MD Paulo Novis Rocha, MD (N)	Natalia S Oliveira, RN	Salvador	Hospital da Bahia (5)
	Alexandre Schaan de Quadros, MD Renato Abdala Karam Kalil, MD José Luiz da Costa Vieira, MD Gabriel Grossmann , MD Pedro Píccaro de Oliveira, MD Leonardo Bridi, MD Simone Savaris, MD Renato George Eick, MD (N)	Aline Peixoto Deiro Alice Manica Muller Maria Antonieta Pereira de Moraes Bruna Maria Ascoli Sílvia Zottis Poletti	Porto Alegre	Instituto de Cardiologia de Porto Alegre (1)
	Paola Emanuela Poggio Smanio, MD, PhD Leda Lotaif , MD, PhD (N)	Leonardo Pizzol Caetano, PhD	São Paulo	Instituto Dante Pazzanese de Cardiologia (1)
Hungary (12) Lead Country Cardiologist Andras Vertes, MD Lead Country Nephrologist Peter Voros, MD				
	Andras Vertes, MD Peter Voros, MD (N)	Judit Sebo, MD Zoltan Davidovits, MD Laszlone Matics	Budapest	Eszszk- Szent Istvan Hospital (10)
	Bela Merkely , MD, PhD, DSc Mihaly Tapolyai, MD (N)	Andrea Barty kowszki, MD Pal Maurovich-Horvat, MD, PhD, MPH	Budapest	Heart and Vascular Center, Semmelweis University (1)
	Albert Varga, MD, PhD Timea Boros, MD (N)	Gergely Ágoston, MD	Szeged	University of Szeged (1)
Lithuania (12) Lead Country Cardiologist Jelena Celutkiene, MD Lead Country Nephrologist Marius Miglinas, MD, PhD				
	Aleksandras Laucevicius, MD Jelena Celutkiene, MD Marius Miglinas, MD (N)	Agne Juceviciene, MD Irma Kalibataite-Rutkauskiene, MD Laura Keinaite Monika Laukyte Gelmina Mikolaitiene Akvile Smigelskaite, MD Ilona Tamasauskiene, MD Agne Urboniene, MD	Vilnius	Vilnius University Hospital Santariskes Clinic (12)
Portugal (10) Lead Country Cardiologist Ruben Ramos, MD Lead Country Nephrologist Fernando Nolasco, PhD				
	Ruben Ramos, MD Duarte Cacela, MD Ana Santana, MD Antonio Fiarresga, MD Lidia Sousa, MD Hugo Marques, MD Lino Patricio, MD Luis Bernanrdes, MD Pedro Rio, MD Ramiro Carvalho, MD Rui Ferreira, MD	Mafalda Selas Filipa Silva Cláudia Freixo	Lisbon	Hospital de Santa Marta / Hospital Curry Cabral (8)

	Tiago Silva, MD Ines Rodrigues, MD Pedro Modas, MD Guilherme Portugal, MD Jose Fragata, MD Marina Vieira , MD Fernando Nolasco, PhD (N) Marina Vieira., MD Fernando Caeiro, MD			
	Pedro Farto e Abreu, MD Sérgio Bravo Baptista, MD, PhD Miguel Borges Santos, MD Patricia Carrilho, MD (N)	Maura Carina Nédio, BSc	Amadora	Hospital Professor Doutor Fernando Fonseca, EPE (1)
	Fausto J. Pinto, PhD Miguel Nobre Menezes, MD Guilhermina Cantinho Lopes, MD Ana Gomes Almeida, PhD Pedro Canas Silva, MD Angelo Nobre, MD Ana Rita Francisco, MD Jose Lopes, MD (N)	Inês Zimbarra Cabrita, PhD Andreia Rocha, MSc Francisca Patuleia Figueiras, PhD Andreia Coelho, BSc Marta Capinha Maria Inês Caetano Susana Silva	Lisbon	Santa Maria University Hospital, Cardiology Department, CHLN (1)
Spain (9) Lead Country Cardiologist Almudena Castro, MD Lead Country Nephrologist Rafael Selgas, MD				
	Jose Lopez-Sendon, MD, PhD Almudena Castro, MD Elena Refoyo Salicio, MD Gabriela Guzman, MD Gabriel Galeote, MD Silvia Valbuena, MD Rafael Selgas, MD (N)	Virginia Fernández-Figares, Pharm	Madrid	Hospital La Paz. IdiPaz (6)
	Jesús Peteiro, MD, PhD María Dolores Martínez-Ruíz, MD Ruth Pérez-Fernández, MD José J Cuenca-Castillo, MD Xacobe Flores-Ríos, MD Óscar Prada-Delgado, MD Gonzalo Barge-Caballero, MD Miguel Perez Fontan, MD (N)	Moisés Blanco-Calvo, PhD Encarnación Alonso-Álvarez, BSc Paula García-González, BSc	A Coruna	Complexo Hospitalario Universitario A Coruña (CHUAC) Sergas, Department of Cardiology. INIBIC A Coruña. CIBER-CV. Universidad de A Coruña, Spain (2)
	Vicente Miro, MD Jose L Diez, MD Pilar Calvillo, MD Julio Hernandez Jaras, MD (N)	Begoña Igual, MD	Valencia	Hospital Universitario y Politecnico La Fe (1)
Argentina (6) Lead Country Cardiologist Luis Guzman, MD Lead Country Nephrologist Rafael Maldonado, MD				
	Mariano Rubio, MD Rafael Maldonado, MD (N)	Graciela Scaro, MD	Cordoba	Clínica Privada Vélez Sarsfield (5)
	Julio César Figal, MD	Matías Nicolás Mungo	Ciudad Autonoma de Buenos Aires	Fundación Favaloro (1)

	Oscar Méndiz, MD Claudia Cortés, MD Roberto René Favaloro, MD Pablo Raffaele, MD (N)			
France (6) Lead Country Cardiologist Emmanuel Sorbets, MD, PhD Lead Country Nephrologist Eric Daugas, MD, PhD				
	Philippe Gabriel Steg, MD Jean-Michel Juliard, MD Eric Daugas, MD, PhD (N) Emmanuel Sorbets, MD, PhD	Helene Abergel, MSc Axelle Fuentes, MSc	Paris	Bichat Hospital (4)
	Christophe Thuaire, MD Téodora Dutoiu, MD Catherine Albert, MD (N) Bougrida Hammouche, MD (N)	Corine Thobois, RN Emilie Tachot, RN Christophe Laure, RN Christel Vassaliere, RN	Chartres	C.H. Louis Pasteur (2)
New Zealand (6) Lead Country Cardiologist Gerard Patrick Devlin, MD Lead Country Nephrologist Peter Sizeland, MD				
	Gerard Patrick Devlin, MD Raewyn Fisher, MD Peter Sizeland, MD (N)	Liz Low, RN Jayne Scales, RN Kirsty Abercrombie, RN	Hamilton	Waikato Hospital (6)
United Kingdom (5) Lead Country Nephrologist David Wheeler, MD				
	Roxy Senior, MBBS, MD, DM Ahmed Elghamaz, MB BCh Sothinathan Gurunathan, MBChB Nikolaos Karogiannis, MBBS Benoy N Shah, MD, MBBS, BSc (Hons) Richard HJ Trimlett, MBBS, CCST Michael B Rubens, LRCP, MRCS, MBBS, DMRD Edward D Nicol, MD, BMedSci, MBBS, DTM&H Tarun K Mittal, MD Neill Duncan, MD (N)	Grace M. Young , MSc, BSc (Hons) Christopher Kinsey Raisa Kavalakkat, MSc, BSc, RN Jo Evans, RN Ikraam Hassan, RN Emma Howard, MSc, BSc Ann Banfield, BSc, RN Reinette Hampson, BSc (Hons), BA (Hons) Rory Collins, BSC Anastasia Vamvakidou, MBBS, MRCP	Harrow	Northwick Park Hospital Harrow/ Royal Brompton Hospital London (2)
	Reto Andreas Gamma, MBBS Sumith Abeygunasekara, MD (N)	Sarah Williams, RN Kim Holland, RN Karen Swan, RN	Chelmsford	Broomfield Hospital (1)
	Khaled Alfakih, MBBS, MD Jonathan Byrne, PhD Ian Webb, PhD, MA (N)	Abigail Knighton, BSc., PG Dip. Katherine Martin, RGN, Dip. N, MSc	London	King's College NHS Foundation Hospital (1)
	Dwayne S. G. Conway, MD	Judith Wright Donna Exley	Wakefield	Pinderfields Hospital (1)
Serbia (5) Lead Country Cardiologist Branko D. Beleslin, MD, PhD Lead Country Cardiologist				

Sanja Simic Ogrizovic, MD				
	Branko D. Beleslin, MD, PhD		Belgrade	Faculty of Medicine, University of Belgrade; Cardiology Clinic, Clinical Center of Serbia (5)
	Nikola N. Boskovic, MD	Ana D. Djordjevic-Dikic, MD, PhD		
	Marija T. Petrovic, MD	Vojislav L. Giga, MD, PhD		
	Milan R. Dobric, MD	Jelena J. Stepanovic, MD, PhD		
	Zeljko Z. Markovic, MD, PhD			
	Ana S. Mladenovic, MD, PhD			
	Sanja Ogrizovic, MD (N)			
Australia (4)				
Lead Country Cardiologist				
Joseph B. Selvanayagam, MBBS (Hons), Dphil				
Lead Country Cardiologist				
Magid Fahim, MBChB, FRACP				
	Joseph B. Selvanayagam, MBBS(Hons), DPhil	Sau Lee, PhD	Adelaide	Flinders Medical Centre and College of Medicine and Public Health (4)
	Majo X. Joseph, MBBS	Prince Thomas, RN		
	Jonathan M Gleadle, BM Dphil (N)			
Austria (4)				
Lead Country Cardiologist				
Herwig Schuchlenz				
	Herwig Schuchlenz, MD	Gudrun Steinmaurer	Graz	LKH Graz West Austria (3)
	Stefan Weikl, MD			
	Irene Marthe Lang, MD	Max-Paul Winter, MD	Vienna	Medical University of Vienna, Department of Cardiology (1)
Belgium (4)				
Lead Country Nephrologist				
Kathleen Claes, MD, PhD				
	Kaatje Goetschalckx, MD	Valerie Robesyn	Leuven	University Hospital Leuven (3)
	Frans Van de Werf, PhD, MD			
	Kathleen Claes, MD, PhD (N)			
	Christiaan Vrints, MD	Nathalie Brosens	Edegem	Universitair Ziekenhuis Antwerpen (1)
	Bharati Shivalkar, MD			
	Amaryllis Van Craenenbroeck, MD (N)			
Israel (4)				
	Yaron Arbel, MD	Daniela Puzhevsky	Tel Aviv	Tel Aviv Sourasky Medical Center (4)
	Doron Schwartz, MD (N)	Miri Revivo		
	Orit Kliuk, MD			
Egypt (3)				
	Magdy Abdelhamid, MD	Ahmed Talaat, MD	Cairo	Cairo University (3)
	Ahmed Kamal, MsC			
	Hossam Mahrous, MD			
	Mohamed Adel , MsC			
	Hussien El Fishawy, MD (N)			
United Arab Emirates (2)				
	Wael A. Almahmeed, MD	Virendra Misra, MD	Abu Dhabi	Sheikh Khalifa Medical City (2)
	Mohamed Hassan, MD (N)			
	Seema Nour, MD			
	Abdallah M. Abdallah, MD			
	Salamah Alfalahi, MD			

Germany (1)				
Lead Country Cardiologist				
Rolf Doerr, MD				
	Rolf Doerr, MD	Karin Ploetze, PhD	Dresden	Praxisklinik Herz und Gefaesse (1)
	Gregor Simonis, MD, PhD	Franziska Guenther		
	Juergen Stumpf, MD	Kerstin Bonin		
	Clemens T. Kadalie, MD	Kerstin Mikes, RN		
	Klaus Matschke, MD, PhD	Katharina Knaut		
	Doreen Reimann, MD (N)			
Macedonia (1)				
	Sasko Kedev, MD, PhD		Skopje	University Clinic of Cardiology (1)
	Irena Peovska Mitevska, MD, PhD			
	Elizabeta Srbinovska Kostovska, MD, PhD			
	Hristo Pejkov, MD, PhD			
	Zvezdana Petronijevic, MD (N)			
	Liljana Tozija, MD (N)			
Netherlands (1)				
	Robert K. Riezebos, MD, PhD		Amsterdam	Cardio Research Hartcentrum OLVG (1)
	Pouneh Samadi, MD	Jeannette, J. M. Schoep, RN		
	Elise van Dongen, MD	Elisabeth, M. Janzen, RN		
	Sander R. Niehe, MD			
	Yves Smets, MD (N)			
Romania (1)				
	Calin Pop, MD, PhD		Bucharest	Emergency County Hospital Baia Mare (1)
	Matei Claudia, MD, PhD			
Sweden (1)	Florina Chereches, MD (N)			
Lead Country Cardiologist				
Claes Held, MD, PhD				
	Claes Held, MD, PhD	Christina Björklund, RN	Uppsala	Uppsala University (1)
	Axel Åkerblom, MD, PhD	Maria Andreasson, RN		
	Inga Soveri, MD, PhD (N)			

* *(N) = Nephrologist*