

3.9 MRI

I. PURPOSE

The use of MRI may provide the basis for determining how subclinical disease progresses to clinical disease. This technology is also useful in demonstrating the relationship of MRI parameters to existing measures of CVD and the predictive value of these measures for progression to clinical events. Additionally, it allows the refinement of risk stratification algorithms that reliably identify high-risk persons for targeted interventions in a cost effective manner. Finally, it can provide the assessment of risk estimates in subgroups of participants according to ethnic background/race.

II. MATERIALS/EQUIPMENT

The MRI Centers have all equipment necessary.

III. DEFINITIONS

IV. METHODS

1. Participant Preliminaries

1.1 Initial contact for the MRI study will be the first clinic exam. During the exam, the interviewer will ask a series of questions to determine whether the participant is eligible for an MRI. Responses that make a participant ineligible for the MRI are marked with an asterisk on the Exclusion Form, and if a participant gives one or more of these responses, he or she is not eligible for an MRI. The participant will be thanked and the interview ended.

1.2 If the participant is eligible for MRI, the interviewer will give a brief explanation of MRI and determine if the participant is able to hold his/her breath for the time required for the study (see following script and explanations).

1.21 **“My name is _____. I am going to talk with you about your MRI examination. MRI is short for Magnetic Resonance Imaging, a technique that allows us to see internal organs without X-ray, surgery, or pain. MRI is safe and not harmful to the body. MRI measures the size and function of the heart and takes a detailed picture of the heart that other diagnostic tools cannot take. The MRI examination will take about 40 minutes. During the MRI examination, your blood pressure will be also measured and an EKG tracing will be obtained.**

At the beginning of the examination, you will be asked to lie down on the scan table. Then the technologist will slowly slide you into the machine. It looks like a hollow tube. The space inside this

tube is somewhat tight and some people get claustrophobic.”

- 1.22 At this point ask, **“Do you have any problems being in close or narrow spaces? That is, do you suffer from claustrophobia?”** **If yes**, try to assess whether the participant will be able to have MRI or not. **If you think he/she will not be able to do the MRI, stop here.** Inform the participant that it is better that he/she does not have this part of the exam. **If no**, or if you believe that the participant will be able to have the MRI examination, **proceed** with the following script.

- 1.23 **“While in the MRI machine, there will be some loud knocking sounds when the pictures are being taken. You will be provided with earplugs to help block out the noise.**

The technologist will ask you several times to hold your breath and stay still to be able to get good pictures. You will be asked each time to hold your breath for twenty seconds. This part is very important because we cannot do the MRI examination, if you cannot hold your breath long enough.

Now, we will practice holding your breath to make sure that you will be able to do this during the MRI examination. I will ask you to hold your breath for several times. Each time, I will time you with my timer to make sure that you can hold your breath for twenty seconds. First, I will demonstrate the proper technique, and then we will practice together.”

- **“Take a very deep breath to fill your chest with air. Then release most of the air slowly until you feel comfortable and then stop breathing.”** (Demonstrate the breathing technique.)
“Remember, it is easier to hold your breath if you start with a very deep breath of air!”
- **“Now, let’s do the breath holding together.”** (Practice the breath hold with the participant using the timer.)
- Ask the participant to practice the breath hold two times, until you feel that he/she will be able to hold his/her breath for 20 seconds. You should always use the timer so that the participant is aware of the duration of the breath hold.

- 1.24 If the participant cannot hold his/her breath for 20 seconds after practicing two times, **do not schedule the MRI**. Thank the participant and inform him/her that he/she will not have this part of the exam.

- 1.25 If the participant can hold his/her breath for 20 seconds, proceed with the following instructions:

- **“On the day of the exam, you don’t have to fast, *unless you are having other procedures, such as a blood draw, that require fasting.* If you are not having any other procedures that require fasting you may eat, drink, and take your medications. That is, do not change your routine.”**
- **Please wear light comfortable clothes and shoes. You may be asked to change into a gown.**
- **You will need to take off your jewelry and watch, because metal objects interfere with the MRI examination.**
- **You should leave your wallet in the provided locker, because the magnetic field of the machine can damage credit cards and other cards that have magnetic strips.”**

1.26 Ask the participant if he/she has any questions and answer them.
Schedule the MRI examination

1.3 The participant may invite a family member or friend to be present during the exam. To further increase participation, interviewers may set appointments for the participant to view a demonstration of the equipment and scanning.

1.4 After the MRI Exclusion Form has been completed, the data manager will scan it into the computer.

2. Participant Preparation and Instructions

2.1 The MRI technician should allot at least *20 minutes* prior to the scheduled MRI exam for participant preparation. During this time, explain the study procedure and answer any questions. Instruct the participant to remove any metallic objects, including jewelry, dentures, hearing aids, hairpins, etc., and secure all items in the participant’s locker.

2.2 All field center will use a standard MRI screening form. The MRI technician should explain to the participant that the exam will take approximately 30 minutes. Explain that movement and/or speaking during the exam will render images suboptimal, and ask the participant to do his/her best to refrain from such activity during the scan.

2.3 The MRI technician should review the “breath-holds” procedure with the participant. The participant will practice breath holding at resting lung volume. Time the participant’s breath-hold capability at least *twice*, using a stopwatch, to insure he/she can maintain the resting lung volume for 20 seconds. Proceed with the exam only when you are satisfied that the participant understands the importance of breath

holding for the exam.

3. MRI Procedure

3.1 Perform all series except series #1 at resting lung volume (end expiration). Give the following instructions for breathing: **“Take a deep breath in, then let it out, then stop breathing.”** Begin imaging when you are certain that the participant has stopped breathing.

3.2 Take a brachial artery blood pressure before and after completion of series 6. Record the results on the MRI Completion Form.

4. MRI Completion Form

Fill out an MRI Completion Form for each participant scheduled for an MRI. The MESA technician will complete the first question on the form, indicating whether the MRI was completed. The MRI technician will complete the bottom part of the form for each participant who begins an MRI scan (whether complete or incomplete). It is the responsibility of the MESA technician to ensure that all parts of the form have been completed.

5. Alerts

5.1 Subjects with certain MRI scan abnormalities may require further medical attention. Perform immediate risk identification initially at the field center for evidence of alert criteria, such as abnormal cardiac indices, masses, adenopathy, and pericardial effusion. Record alerts on the MRI Completion Form.

5.2 The MRI technologist will immediately alert the local radiologist of any potentially clinically significant abnormality at the time the MESA participant is being imaged. If the local radiologist determines that the MRI abnormality constitutes an alert (immediate or urgent referral), the following steps will occur:

5.21 The technologist will make a film copy of the MR scan. Field center personnel will determine where to store these film copies.

5.22 The local radiologist will phone the field center coordinator, who will contact the participant’s physician

5.23 Arrangements for further medical evaluation will be made through discussions involving the participant, referring physician, field center coordinator and the field center radiologist.

5.24 Record the alert on the MRI Scan Coding Form that is sent to the

Reading Center.

