University of Minnesota
Center for Magnetic Resonance Research
Standard Operating Procedure
Human System Magnet Operator Training

SOP Number / Version: SOP001 / Version 2
Approval Date:
Implementation Date:
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Approval Signatures	Date
Author/Owner:	
Regulatory Compliance Coordinator:	
Center Director:	

1. **Purpose**
   The purpose of this procedure is to define the training requirements for operating the human MR scanners at CMRR. The training will ensure that operators have acquired the skills necessary to safely operate the scanner and is necessary to ensure the safety of research volunteers as well the equipment and other researchers or staff.

2. **Scope**

   This procedure will apply to all personnel who intend to operate the human MR systems at CMRR.

3. **Definitions**
   Standard Operating Procedure - A document providing detailed written procedural instructions to achieve consistency and uniformity of the performance of a specific function.

   Trainers – Certified MR Technologists from CMRR will provide the hands-on training and certification for the clinical 3T systems. Training and certification for the non-clinical human MR systems is provided by designated CMRR trainers who CMRR has determined have the necessary education, experience, and training.

4. **Responsibility**

It is the responsibility of all personnel who perform the functions listed in Section 2 to adhere to this SOP.

It is the responsibility of the owner/author listed above to review the content of this SOP for accuracy and continued applicability on at least an annual basis.

5. **Procedure**

5.1 Review Online Module (1-2 hours)
Module will cover basic MR safety, human subjects safety, and CMRR policies and SOP's specific to human subjects research. Module can be found here:
https://www.cmrr.umn.edu/safety/nc-cms/content/upload/CMRR/Human/Research/Training.ppsx

5.2 Sign up for basic MR safety training class (1-2 hours)

Upcoming classes can be found here: https://www.cmrr.umn.edu/access/
Classes will review the material found in the online training module and will provide a tour of the building and the scanner.

5.3 Sign up for basic scanner operator training class (3-4 hours, @ 3T)
Upcoming classes can be found here: https://www.cmrr.umn.edu/access/
Classes will provide a basic overview of safe scanner operation and will include scanning a phantom and a volunteer.

5.3.1 Sign up for basic scanner operator training class for systems other than 3T (~2 hours)
If you intend on utilizing systems other than 3T you must complete the first 3 steps (5.1-5.3) which focus on 3T and then sign up for this class which focuses on the specific magnet you intend to use. Upcoming classes can be found here: https://www.cmrr.umn.edu/access/

5.4 Project specific training (~ months)
All operators are required to scan under the direction of a certified operator until they develop the skills necessary to scan independently. Usually this is provided by other members of the new operators research group or other experienced collaborators. If this is a new research group without certified operators, the magnet trainers can assist you in finding a research group that will allow you to train with them or in some cases may provide the training for you.

5.5 Testing and certification
Once operators feel they have acquired the skills necessary to safely operate the scanner they should contact their trainer to schedule their certification test. This

will involve the trainer observing the new operator as they scan a human volunteer that they have recruited and scheduled. The trainer will observe all steps from consenting to final paperwork being filed and will quiz the operator during the scanning session to ensure that the operator has acquired all of the necessary skills to safely scan. Skills that the new operator is required to be proficient on are found in the CMRR new operator checklist. If the trainer feels more training is required they will inform the operator that they should continue to train with their group and schedule another certification test at a future date.

5.6 Completion Documentation

Upon successful completion of the human system operator training the operator checklist will be signed by the new operator, the trainer, and the new operator's PI. If the new operator is the PI they will sign twice. Once signed by all 3 parties the form is returned to the trainer who enters the information into the CMRR calendaring system and turns the form into CMRR Safety Officer who will file the form.

5.7 Recertification

Recertification is required if the operator has gone more than 12 months, but less than 24 months, without scanning. The recertification training consists of the trainer observing the operator over the course of a scan to ensure that they are still operating the scanner in a safe manner. Over the course of the observation session the trainer will ask questions regarding the safe operation of the scanner and about CMRR scanning policies and will inform the operator of any changes to the system or policies since the last training session. The operator checklist will be used to confirm that the operator is still proficient in all skills necessary to safely operate the scanner. Upon recertification the updated form will be signed by all 3 parties. The trainer will update the training information in the CMRR calendaring system and deliver the form to the CMRR Safety Officer who will file it.

If an operator has gone more than 24 months without scanning they must redo the entire operator training process.

6. Forms and Templates

Operator Training Checklist Attached

7. Appendices / Tables
N/A

8. Revision History

Version Number	Approval Date	Change from Previous Version
2		Added updated links, changed recertification process, combined other human system training with 3T training, added tracking information

Name: _____

Operator's Training Checklist for those Conducting Human Research at the CMRR

The purpose of this document is to provide a list of key tasks that operators of the human research systems will need to know to safely operate the scanner as well as serving as a "hands on" review of pertinent safety materials covered in the CMRR Safety presentation. This list can be used as both a catalog of skills which need to be learned, as well as a check-off list for testing of skills. This checklist will be used for certifying completion of training and is signed by both the trainer and the trainee.

Safety

- ☐ Reviewed CMRR Human Subjects Safety & Policies Manual
- ☐ Location and use of quench button(s)
- ☐ Location and use of electrical shutdown button(s)
- ☐ Location of MR safe gurney and wheelchairs
- ☐ Location of AED's and CPR one-way breathing valves
- ☐ Review of building emergency procedures (medical and fire)
- ☐ Location and use of emergency power shutoff buttons
- ☐ Location of first aid kits
- ☐ Location and use of fire extinguishers
- ☐ Location and use of magnet emergency stop buttons
- ☐ Procedures for removing subject from magnet in an emergency
- ☐ Use of emergency squeeze ball
- ☐ 2 person rule

Subjects

- ☐ Safety screening of subject and anyone accompanying them to scanner
- ☐ Escorting subject to/from scanner following transport lights
- ☐ Subject Gowning
- ☐ Use of scanner linen
- ☐ Final screen and pat down prior to entering magnet room
- ☐ Familiarizing subjects with the scanner and its operation including showing them the table, the surrounding magnet, expected sounds during the scan, methods for communication including the intercom and the squeeze ball as well as informing subjects of the possibility that they may experience dizziness upon exiting the scanner
- ☐ Positioning of subject on the table to minimize risk of nerve stimulation or burns
- ☐ Use of earplugs and/or headphones
- ☐ Use of knee and other pads
- ☐ Routing and positioning of cables in bore to minimize burns
- ☐ Moving the subject to the magnet isocenter (patient table operation)
- ☐ Safely landmarking of subject using the laser system
- ☐ Adjusting light, airflow, and sound volume for subject comfort
- ☐ Removing subject from the magnet

General Magnet Operation

- ☐ Use of intercom communication system
- ☐ MR operating modes (what different modes indicate)
- ☐ Use of SAR monitoring system
- ☐ Procedures for setting up an RF coil
- ☐ Location of documentation for specific RF coils
- ☐ Procedures for reporting equipment problems

- ☐ Review of all peripheral equipment
- ☐ Coil handling and storage
- ☐ Scanner software operation
- ☐ Routine electrical shutdown procedures
- ☐ How to start up the console from a power off condition
- ☐ Clean-up of magnet room and console room
- ☐ How to configure Transmit and Receive based on operation mode (parallel vs single, narrow band vs wide band, H vs X nuclei, etc.) (if applicable)
- ☐ Default RF front-end connections (if applicable)
- ☐ Adjusting RF power (if applicable)
- ☐ Power on/off and reset of RF and gradient amplifiers (if applicable)
- ☐ Power on/off and rebooting scanner electronics (if applicable)

Information Technology
- ☐ Procedure for reporting incidental findings
- ☐ Marking time on web scheduler as used. Use of web based scheduling system including scheduling a session, canceling a session, and marking a session time as used
- ☐ How to safely and securely transfer data
- ☐ Subject registration into scanner database (if applicable)

Training Completion Date: _____   Magnet Covered: _____

Initial Training ____   Recertification Training ____

By signing below I attest that I have provided all of the above training to the individual listed below and that they have demonstrated the ability to safely operate the scanner.

Trainer Name: _____   Trainer   Signature: _____

By signing below I attest that I have received all of the above training from the individual listed above and I have read and understood the relevant CMRR Human Subjects Safety & Policy Manual. I understand that I am ultimately responsible for the safety of my subjects and that it is my responsibility to verify appropriate SAR and SPL limits for my specific application before scanning any subjects.

Trainee Name: _____   Trainee   Signature: _____

PI signature (required for students, staff, and post-doctoral trainees): By signing below I attest that at my direction the above named will be operating the scanner independently and taking responsibility for the safety of research subjects, which includes identifying a second person who will be present in the building and available to assist during all scans.

PI Name: _____   PI   Signature: _____