



BCCH MRI Research Facility

Tel 604.875.2000 x5460
Fax 604.875.3076

www.bcchr.ca/3tmri

Street Address:
4480 Oak Street, Entrance 99
Vancouver, BC V6H 3V4

Mailing Address:
950 West 28th Avenue
Vancouver, BC V5Z 4H4

POLICY: Safety Practices at the BCCH MRI Research Facility

CATEGORY: SAFETY DAP REF: DSA

APPROVED BY: Dr. Bruce Bjornson EFFECTIVE DATE: January 24, 2018
REVISED DATE: June 17, 2022
DATE TO BE REVIEWED: June 30, 2025

1.0 PURPOSE:

The BCCH MRI Research Facility has installed a GE Discovery MR 750 3T MRI System. To mitigate the risks and safety hazards unique to 3Tesla MRI environments, this overarching safety policy and the procedures outlined are intended to supplement safety regulations and policies already established at the Children's and Women's Health Care Centre of British Columbia (C&W), the Provincial Health Services Authority, and where relevant, the Vancouver Coastal Health Authority, to protect staff, resources, and all visitors to the Facility (including research teams and their subjects).

2.0 SCOPE:

The BCCH Research MRI Facility has implemented policies and procedures to ensure the safety of people and technology:

- Safety Officer
- Safety Policy for Researchers and Visitors
- Screening and Approval of Researchers and Visitors
- MRI Safety Training
- GE 3.0T Discovery MR 750 Scanner Operators
- Emergency Procedures
- Incidents
- No Scent Policy
- BCCH MRI Research Facility Protocol Review Committee
- Research Subjects
- Incidental Findings
- Gadolinium Injection Policy
- Access and training for Emergency Personnel
- Access and training for Custodial Staff

3.0 PROCEDURE/METHODOLOGY:

Safety Officer:

- The Facility's Head MR Technologist is appointed as the Safety Officer to oversee all elements of the Safety Policy. The Safety Officer is responsible for coordinating all safety training, monitoring safety

compliance, liaising with emergency personnel and custodial staff, and maintaining records of screening activities and safety incidents. The Safety Officer will report periodically to the BCCH MRI Research Facility Operations Committee and will propose any changes to the Safety Policy as needed. The Safety Officer is also a part of the MR Safety Committee that includes the clinical MRI at the Facility.

Safety Policy for Researchers and Visitors:

- The facility is divided into a number of “Safety Zones”, each with a different degree of stringency in the rules and regulations that apply to that area (summarized in Figure 1 and Table 1). Access to these zones is restricted according to a person’s “Safety Level”, which is determined by his or her degree of safety training and screening approval (summarized in Table 2).

FIGURE 1: BCCH 3T MRI Research Facility

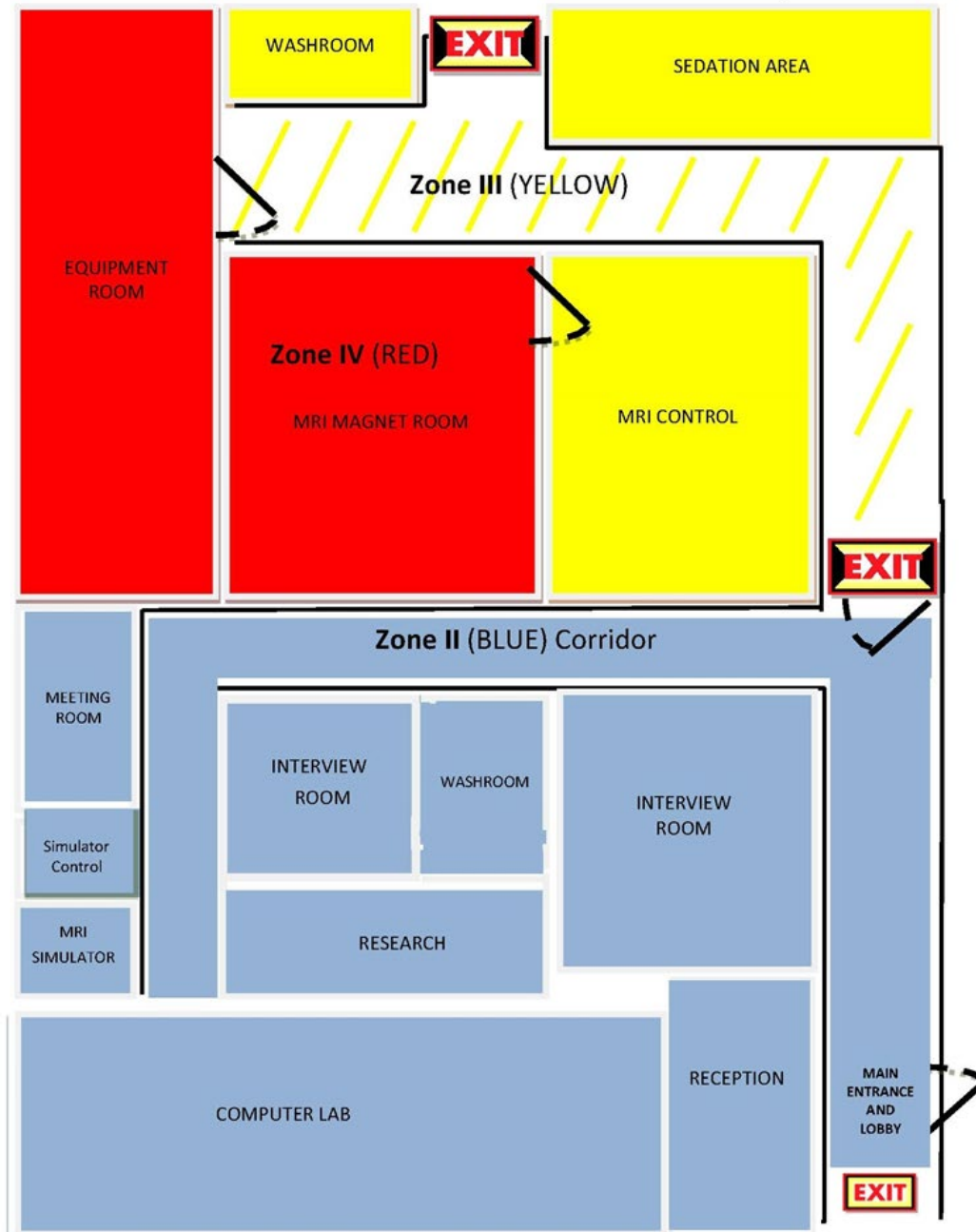


TABLE 1: BCCH MRI Research Facility SAFETY ZONES

ZONE	LOCATION	RULES
I	Anywhere outside of MRI Facility	<ul style="list-style-type: none"> • General Public Access
II	Reception area, waiting rooms, meeting rooms, interview rooms, Simulator Room and Computer lab	<ul style="list-style-type: none"> • All persons must check in at reception. • Unscreened MRI patients • Access to areas for staff with appropriate security clearance
III	Highly Restricted Access: Technologist Control Room, anesthesia area	<ul style="list-style-type: none"> • All persons must check in at reception. • Entry restricted to persons supervised by MR Technologist or Facility scientist • Security door must be kept closed • Area in front of magnet room door and 3T console area must be kept clear of unnecessary articles. • Persons may be asked to leave the Zone 3 (III) immediately in consideration of patient confidentiality and privacy. • Prolonged access requires MRI user Safety training. • Professional conduct expected at all times.
IV	MRI Technologist Supervised: Magnet Room within the 5 Gauss Line and the Equipment Room.	<ul style="list-style-type: none"> • Entry is denied if unscreened or having contraindications to magnetic field exposure (e.g., Pacemakers or pregnancy) • No loose metallic objects/equipment allowed in the magnet room. • Magnet door must remain closed unless otherwise authorized. • Prolonged access requires MRI User Safety Training

TABLE 2: Safety Levels for Visitors and Users

Safety Level	Access Desired	Requirements	Responsibilities
General Public	Entry to Zone II if cleared by Facility Staff	<ul style="list-style-type: none"> • No screening required 	<ul style="list-style-type: none"> • Must Not Enter Zone IV . (MRI Scan Room)
Screened Visitors and MRI patients	Entry to Zone III (with supervision) for short-term visit	<ul style="list-style-type: none"> • Complete Screening Form • Pass screening consultation by the MR Technologist • Allowed entry to magnet room ONLY if accompanied by MR Technologist or Facility Scientist 	<ul style="list-style-type: none"> • Follow safety instructions from MR Technologist or Facility Scientist
MRI Personnel and screened MRI patients	Access to Zone III and Zone IV to support the execution of MRI experiment	<ul style="list-style-type: none"> • Attend Safety Orientation and watch MRI Safety Video given by Safety Officer • Complete a screening form • Screened by MRI Technologist • Sign Safety Log and User Training Checklist • Zone 3/4 access with MRI supervision only 	<ul style="list-style-type: none"> • Follow safety rules outlined by MR Technologist or Facility Scientist and video • Must be familiar with safety procedures, including Quench and Emergency procedures • Notify MR Technologist if screening status changes

Screening and Approval of Researchers and Visitors

- All visitors entering Zone IV (magnet room) must be screened for contraindications before entering. Personnel will be asked to complete and sign an MRI Screening Form and undergo a screening interview with an MRI Technologist, after which a decision will be made regarding the individual's suitability to safely enter a 3T magnetic field environment. If any contraindications are revealed during the screening process, the individual will be restricted from Zone IV, but may still be allowed access to Zone III with supervision.
- Screening interviews and access decisions are the responsibility of the MR Technologists. If there is uncertainty regarding a person's screening status, that person may not be enter Zones III or IV.
- Individuals are required to fill out the MR screening form annually; however, they must inform the MR Technologist if their screening status changes between annual screenings (e.g., possibility of pregnancy, recent surgery). MR Technologists will review an individual's screening status from time to time and update their screening form on file, especially if the applicant is returning from a long absence (over 6 months) away from the facility.
- Individuals entering Zone IV (Magnet room) are required to remove all metallic objects outlined in Safety training. All additional apparatus (such as positioning devices) related to the experiment must be approved during protocol review (by the 3T Protocol Review Committee). **ALL** individuals must check with the MR Technologist or Facility Scientist before entering the scan room each day to ensure safety procedures are strictly enforced.

MRI Safety Training

- Short-term visitors wishing to enter Zones III and IV will undergo some basic safety training and a brief orientation by Facility MRI Technologist or Facility Staff.
- All users wishing prolonged access to the Zones III or IV are required to complete the User Safety Orientation. Compliance is documented by a signed MRI User Training Checklist and MR Safety Log.
- An MRI User Safety Orientation and Training Session must be organized through the MR Technologist. This session, presented by an MRI Safety Officer, includes:
 - Viewing of MRI Safety Video
 - Precautions when entering the magnet room
 - Emergency quench procedure
 - Medical emergency procedure
 - Instructions for recruiting volunteers and patients, and their safety.

GE 3.0T Discovery MR 750 Scanner Operators

- Qualified scanner operators will be limited to the following:
 - Registered MR Technologist (RTMR) with current CAMRT membership
 - GE Clinical Scientist (phantom scanning only)
 - UBC MRI Research Facility Scientist (phantom scanning only)
 - Graduate students and Scientists with a strong background in MR physics who require Facility approved privileged access to the scanner to carry out research projects involving MR technique development. Restricted scanning privileges will apply in such cases.

****All Research and Clinical participants will be scanned by a Registered MR Technologist****

- The 3T MR system will be operated in strict adherence to existing Canada Health and Welfare safety guidelines regarding acoustic noise, static magnetic field, pulsed gradient magnetic fields and radiofrequency electromagnetic absorption (SAR).

Emergency Procedures

Quench:

- Quenching abolishes the magnetic field of the MRI. **Never Quench unless absolutely necessary.** A quench may cause severe burns and asphyxiation. It may also cause the air to liquefy and feed a fire which may cause an explosion. During a quench, the liquid helium is evacuated through a vent to the outside. Replenishing the helium is very costly and time consuming, from several days to several weeks, during which time the MRI scanner will be nonoperational.
- A quench is initiated by an MRI Technologist or by pushing the quench button only in an emergency situation, such as a person being pinned to the scanner by a metal object due to the magnetic field.

In the event of a quench:

- a) Clear the scan room of all persons possible
- b) Close and secure the scan room door
- c) Call Security and the Fire Department
- d) Notify the GE MR Service engineer and Clinical Scientist
- e) Notify the Facility Scientific Director(s) and Director of Operations

An incident or medical emergency requiring medical attention:

When possible, the operator will remove the subject from the scan room, so the emergency response team will not be required to enter the scan room.

In the event of an incident or medical emergency, depending on severity, the following emergency responses are available:

- Initiate **Code Blue** emergency response. **DIAL 7111** to report the Code to Switchboard who will initiate the Code Blue Response Team. For **adult** codes, call **9-1-1** as well. Refer to the *Resuscitation Notification Process* posted by the phones.
- The MR Technologist will remove the subject from the room and lock the door. There is a crash cart located in the stretcher bay of Zone III (Yellow). The researcher is responsible for keeping the doors open and allowing code teams to access the area
- The MR Technologist will stay with the patient until the Code Team arrives, connect patient to MR conditional monitoring equipment, and provide CPR as needed.

The BCCH Research MRI Facility complies with the UBC policy, "Incident Reporting and Incident Investigations"

- <https://srs.ubc.ca/health-safety/safety-programs/accident-incident/accidentincident-reporting-for-workers/>
- https://www.cairs.ubc.ca/public_page.php

Procedure in the event of a fire (RACE):

- a. Remove anyone in immediate danger to safety and close all doors.

- b. Activate fire alarm pull station and **DIAL 7111** to report fire and location.
 - i. If necessary, **Call 9-1-1** when it is safe to do so. It is helpful for the fire department to get direct information from the personnel involved.
- c. Close doors and windows to prevent spread of fire and smoke.
- d. Extinguish if safe to do so, or Evacuate the area if it is unsafe.

No Scent Policy

The Children's and Women's Health Care Facility of British Columbia and the MRI Research Facility are scent free environments. All staff, researchers, patients, volunteers and visitors **MUST** refrain from wearing scented products (perfume, aftershave, scented shampoos, etc.). Any persons wearing scented products will be asked to remove scent (wash) or leave the MRI Research Facility.

BCCH MRI Research Facility Protocol Review Committee

This Committee is comprised of individuals knowledgeable of research procedures in MR, medicine and physics. The Protocol Review Committee is responsible for review and approval (or disapproval) of protocol proposals for all research uses of the 3T GE MR scanner. Research studies will not be conducted without the approval of both the BCCH MRI Research Facility Protocol Review Committee and the C&W Ethics Board.

Research and Clinical MR Participants

- All Participants will be closely monitored during the MR procedure. An emergency call bell will be given to the Participant who will be instructed to notify the MR Technologist of discomfort of any kind. Should this occur, the scan will immediately be terminated and the Participant removed from the magnetic field.
- Normal healthy Participants will be required to:
 - Sign an approved C&W Ethics Board Consent Form (Research Participants)
 - Complete a MRI Screening Form for contraindications to MRI
 - Review MR Screening with MR Technologist or Level 2 MRI Personnel
 - Change into hospital garments. There will be no street clothes allowed, only underwear and socks not containing antimicrobial metal fibres. Underwear and socks must not have zippers, sparkles, etc. No sports bras, t-shirts, sweatpants or variations of yoga/exercise garments.
 - Remove ALL jewelry and piercings, metallic objects, dentures, hearing aid devices and medication patches
 - Refrain from wearing eye makeup or scented products.
- Participants **MUST** remain in Zone II until permission to enter Zones III and IV is given by the MR Technologist or Facility Staff.
- ****Participants with implants will not be scanned****
 - Participants with implants will be scanned according to safety guidelines and UBC Ethics approval. Researchers may be required to forward operative reports for certain implants in patients to the MR Technologist for radiologist's review.

- ****Participants with possible metal in the eye will not be scanned****
- Participants with possible metallic foreign body in the eye will be required to have an orbital x-ray reported by a radiologist before proceeding with study. The Participant's referring physician is responsible for ordering orbital x-rays. The BCCH MRI Research Facility will NOT refer Participants for orbital x- rays.

Incidental Findings

- All scanning protocols are designed to answer research questions for studies approved by the Protocol Review Committee and C&W ethics. Research scans are typically not designed for clinical diagnosis. Study and protocol development scans will NOT be routinely reviewed by a Radiologist. If a finding is incidentally identified (by the Head MR Technologist) in healthy normal research participants, a Radiologist will review the scans and instruct if any action is necessary. The Head MR Tech will notify the Study's Principal Investigator (PI) and take the following actions if the finding may be of potential clinical significance and requiring possible follow up. The PI will either:
 - Contact the Participant's primary care physician if the PI is a physician, OR
 - The PI will explain to the research participant that an incidental finding has been identified, and with their permission, contact his/her family physician.
- Please note:
 - **The follow-up of incidental findings will NOT be performed at the BCCH MRI Research Facility or by its Staff.**
 - A clinical radiology report of research scans will NOT be issued.
- All potential incidental findings identified by investigators, including students, research assistants, scientists, and principal investigators **must be reported to the 3T MR Technologist** in order to review and facilitate a review, if deemed necessary, by the Facility Radiologist. In the event that the Facility Radiologist is unavailable to review the scans and the incidental finding is felt to be of potential clinical concern, one of the BC Children's Hospital (BCCH) Radiologists will be contacted for a preliminary consultation.
- All incidental findings, actions, and follow up will be recorded in the Incidental Finding Log and reported biannually to the BCCH MRI Research Facility Operations Committee. The incidental findings policy will be reviewed biannually to ensure commitment to scientific research integrity and ethical responsibility of subject welfare and privacy.

Gadolinium Injection Policy

At this time, the BCCH MRI Research Facility does not offer injectable contrast agents.

Access and training for Emergency Personnel

It may be necessary for BCCH Security, paramedics, and fire department personnel to enter the Facility in response to an emergency situation. In the case of an emergency, Facility staff or MR Technologists will immediately remove Participant from the scan room. Facility staff will assist and inform emergency responders, with regard to potential hazards in responding to situations inside the magnet room, and initiate a magnet quench if required.

All emergency personnel who may potentially respond to an emergency within the 3T Facility must undergo a safety orientation and consultation with Facility staff or an MR Technologist.

Access and training for Custodial Staff

Custodial staff will have access to the Zone II, but will be required to complete a Safety Orientation before entering the Zone III. Custodial staff are not permitted in Zone IV.

4.0 RESPONSIBLE PERSONNEL:

Facility Director
Head MR Technologist
Operations Manager

Revision Date & Person	Revision Made
17 June 2022 & Jaemin Chung	<ul style="list-style-type: none"> - Instruction to call 9-1-1 added for sections for medical emergency and fire response. - Added “connect patient to MR conditional monitoring equipment” under An incident or medical emergency requiring medical attention: