Northeastern University Biomedical Imaging Center (NUBIC) -- COVID-19 Standard Operating Procedures --

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Overview

The Northeastern University Biomedical Imaging Center (NUBIC) is a Magnetic Resonance Imaging (MRI) Core Facility at Northeastern University, located in the basement of the Interdisciplinary Science and Engineering Complex (ISEC). NUBIC provides MRI services and support to Principal Investigators (PIs) and their team of experimenters that run human MR imaging studies. The biggest focus at NUBIC is on neuroimaging studies that involve one participant, two experimenters, and one MRI operator. The MRI operator is either the NUBIC's Lead MRI Research Technologist, Fred Bidmead, or the Technical Director, Valur Olafsson.

To ensure safety of the participant, experimenters, and NUBIC staff while in the facility, NUBIC considers it paramount to simultaneously maintain both MRI and COVID-19 safety. With this in mind, and as detailed in this document, NUBIC has put in place a specific COVID-19 Operation Procedures to maintain safe operations.

From an operational flow, the typical experiment involves a human participant meeting the experimenters outside the NUBIC facility and the experimenters escorting the participant into the facility to meet the MRI operator. To maintain MRI safety, the MRI operator screens the participant using a questionnaire and a metal detector before the MRI operator and experimenters escort the participant to the MRI room and put them into the MRI scanner. The participant then undergoes a series of MRI scans with the MRI operator controlling the scanner and the experimenters controlling the visual and audio stimuli given to the participant. After the scans are completed, the participant is taken out of the scanner and exits the facility with the experimenters. Sometimes the participant will undergo pre- or post-scan testing in a dedicated testing room in the facility.

The NUBIC facility is highly controlled and the space is sufficiently large to separate interactions across space and time. Special considerations involve in the cleaning of the MRI scanner between participants (bore, table, and panels), proper use of MRI-safe PPE, and spatial separation of the MRI operator and the experimenters in the MRI control room. The COVID-19 Operation Procedures are carefully structured to minimize human interactions in time and space, create buffers and redundant controls to anticipate human error. The procedures were developed within the framework of the <u>COVID-19 protocols and procedures for Northeastern</u> <u>University</u> as well as the CDC's and ACR's guidance on COVID-19 and MRI use. These procedures are a foundation for a safe execution of human MRI research studies at NUBIC.

Prior to being allowed to resume running human MRI research studies that require access to the MRI in NUBIC, all Northeastern University PIs must submit a Research Resumption Application (RRA). Included in the RRA should be: 1) the inclusion of NUBIC as a Core Facility; 2) a description of any study related pre- and post-scan research activity conducted within the NUBIC facility (excluding MR safety screening and imaging of the participant) to fully disclose and accommodate the risks of conducting said human research activity within the NUBIC facility in the context of the COVID-19 pandemic; and 3) a list of all experimenters that need access to the NUBIC facility for these studies.

Physical Separation Within the NUBIC Facility



Figure 1: Direction of movement when using the MRI, off-limits rooms, and maximum room occupancy for the rooms in the facility that are used during an MRI visit.

Separation of participants, experimenters, and MRI operator within the NUBIC facility is maximized by strategies for concurrent occupation of space and by implementing gaps between participants that allow for several room air exchange cycles within the facility. *Figure 1* and *Figure 2* show the current maximum occupancy per room within the NUBIC facility. Furthermore, three specific challenges are addressed:

- 1. Participant movement into the facility when using the MRI (*Figure 1*) and mock MRI (*Figure 2*).
- 2. Participant movement and positioning in the MRI scanner
- 3. Separation of the MRI operator and experimenters in the MRI control room while conducting the MRI experiment using a three-zone strategy

We first describe modification of the overall space and then separately describe procedures to accommodate each of the three specific challenges.

Overall Modified Use of Space

Nonessential rooms and areas will have restricted access, including the waiting area. This is possible by NUBIC requesting the experimenters to use off-site consent procedures when possible, reducing scan capacity, and implementing an on-demand procedure for participants to enter into the building (see *Participant Movement into the NUBIC Facility and Use of*



Figure 2: Direction of movement when experimenters are using the mock MRI scanner, as well as the maximum occupation for the rooms involved.

Changing Room section below). Specifically, all rooms in *Figure 1* and *Figure 2* with a red circle with a line through it will have restricted access. This minimizes areas that need to be disinfected. There is one single-occupancy restroom that is exclusive to the experimenters, participants, and MRI operator (see *Restroom Use* section for further details). Furthermore, the waiting room capacity is limited as mentioned previously. It should be kept vacant for most studies except for the occasional study that require a parent or guardian to accompany the participant.

Participant Movement into the NUBIC Facility and Use of Changing Room

The participant needs to be told to meet the experimenters outside ISEC and will have to be escorted at a safe distance at all times while in ISEC. Furthermore, the participant and experimenters will have to wear a mask at all times while in the building and during their visit in the NUBIC facility. A participant that shows up without a mask will have to be provided with a mask and NUBIC will provide one if the experimenters are not able to. Prior to entering ISEC we also strongly recommend that experimenters take the temperature of the participant. NUBIC has a contactless thermometer that experimenters can borrow if they do not have access to one.

Once in ISEC, the participant and experimenters will take the stairs or an elevator down to the basement (depending on elevator capacity, the participant may have to take one individually, exit in the basement and wait for the experimenters to join them). The participant will then be escorted to the front door of the NUBIC facility. Once there, the experimenters will ring the



Figure 3: Separation zones of MRI operator (green) and experimenters (black and blue) for the MRI control room during scanning

doorbell to notify the MRI operator that they have arrived. As directed by the MRI operator, the participant and experimenters enter the facility, and the participant may get their temperature checked if they haven't already after coming to campus. Next, the participant and experimenters are required to either use a hand sanitizer (located on the wall by the NUBIC facility entrance) or wash their hands in the testing room.

In the testing room, one experimenter gets the participant consented (if they have not already) and pre-scan tested (if needed by the study). Afterwards, the participant fills out an MRI safety screening form that the MRI operator will review. Once the MRI operator has cleared the participant to be scanned, the participant is escorted into the changing room to change clothes if needed and to safely store their valuables in a locker. The participant will also be required to change their mask to a single-use MRIcompatible mask prior to entering the MRI room. Afterwards the participant will undergo metal screening and once cleared escorted by the MRI operated at a safe distance to the MRI room to be placed on the MRI scanner table. *Figure 1* shows this direction of movement of the participant through the facility.

Participant Positioning on the MRI Scanner Table

While the participant is being positioned on the scanner table with the help of the MRI operator, the experimenter may need to briefly enter the MRI room to instruct the participant on the proper use of the response button box that is needed for the study. In addition to everyone wearing masks, the MRI operator will also wear a plastic face guard and disposable gloves while in the MRI room at all times when a participant is in the room. This is to protect both the MRI operator and participant as there may be direct physical contact when the participant's head is positioned in the MRI head coil, which can be done in under five minutes. To minimize potential contact time, all needed materials and pads will be pre-positioned on the counter close to the MRI scanner table. Prior to sending the participant into the MRI scanner (to isocenter), they are given the option of lowering their mask for comfort. Once the participant is at isocenter, the MRI operator will exit the MRI room, dispose of the gloves, and use a hand sanitizer prior to entering the MRI control room to start the scan.

Separation of the MRI Operator and Experimenters in the MRI Control Room.

Figure 3 shows the three zones that will be taped on the floor of the MRI control room. Zone 1 (shown in <u>green</u>) is where the MRI operator sits in front of the MRI console and faces the window between the MRI room and the control room (*Figure 3* indicates the sightline with a red arrow). Zone 2 (shown in <u>black</u>) is where the first experimenter sits by the presentation computer to control the behavioral equipment and to talk to the participant as they lie in the

scanner. Zone 3 (shown in <u>blue</u>) is where the second experimenter sits to assist with the study and in case of an emergency. The three people should stay in their respective zones while scanning the subject. To maintain appropriate physical distancing in the MRI control room, NUBIC will only allow three people at a time in the room. However, if the study calls for extra personnel, such requests from the PI will have to be reviewed by NUBIC.

Participant Movement out of the NUBIC Facility

After the MRI scan has completed, the MRI operator enters the MRI room wearing a mask, face shield, and gloves. They will then take the participant out of the MRI scanner and make sure their mask covers both mouth and nose as soon as possible. Once the participant has been taken off the MRI table, they will walk back to the changing room, switch back to the mask they wore when they came to the facility while discarding the MRI-compatible mask, change into their clothes if needed, and collect all of their valuables from the locker. The experimenters will then escort the participant out of the facility.

Participant Movement into and Out of the NUBIC Facility for a Mock MRI Visit

The experimenters should follow the same guideline as described in the *Participant Movement into the NUBIC Facility and Use of Changing Room* section to bring the participant into the NUBIC facility. Once inside, they should proceed with hand sanitation as previously described, followed by escorting the participant into the mock MRI room as shown in *Figure 2*. Maximum occupation of the mock MRI room is two people at any one time. Inside the room there are sheets and pillowcases that the experimenter should use to cover the table of the mock MRI and the bottom of the mock head coil respectively. The experimenter will then assist the participant to get on the mock MRI table. Once use of the mock MRI is finished, the experimenter should help the participant off the mock MRI table, followed by wiping the mock MRI with Clorox wipes, including the inside the mock MRI tube if the participant was slid into the tube while on the table. After cleaning, the experimenter will escort the participant out of the NUBIC facility.

Temporal Separation by Working Groups and Dissipation Gaps

Due to the COVID-19 pandemic, the MRI schedule for NUBIC has been adapted to minimize contact between research groups and study participants. This is necessary to maintain a clean and safe working environment in the NUBIC facility for NUBIC staff, experimenters, and participants. *Figure 4* shows an example of how the NUBIC scanning schedule is setup by using







Figure 4: Example of how the NUBIC MRI schedule could look like with a Canonical Use Block that includes a 60min gap where the MRI room is left vacant to allow for aerosol dissipation in the room and a fixed 30min period to clean the MRI room. The Canonical Use Block represents the most likely timeline although there may be cases where the order of events changes. Start and end time may shift depending on the daily schedule.

a Canonical Use Block. Each lab is assigned a block of time to scan their subject. That period includes a fixed 60min gap where the MRI room is left vacant to allow for aerosol dissipation in the room from the participant and a 30min period to clean the MRI room.

MRI Room Aerosol Dissipation Gap and Cleaning

In general, NUBIC will be running a daily schedule that includes a 60min gap after a participant is removed from the MRI scanner, to allow for aerosol dissipation in the MRI room between study participants (see America College of Radiology (ACR) guidelines:

<u>https://www.acr.org/Clinical-Resources/Radiology-Safety/MR-Safety/COVID-19-and-MR-Use</u>). This is needed in case a participant pulls down their face mask when inside the scanner, either due to personal comfort for the participant or a study protocol request. After the aerosol dissipation gap, the MRI room will be cleaned by the MRI operator prior to allowing the next

participant to enter. This is done to maintain a clean and safe environment for study participants.

NUBIC QC and MRI Suite Access

In addition to assigned lab use blocks, early morning times on weekdays are set aside for running QC phantoms and any daily checks that must be made by NUBIC staff. The timing of these blocks positions them before any user and participant have entered the facility and minimizes exposure to NUBIC staff who will be entering the facility.

Limiting the Consequences of an Infection

Even with perfect protocols, we must prepare for, and expect instances of infection to arise within our community due to non-workplace interactions. To limit the consequences of infection all Northeastern experimenters and staff will have to comply with the <u>testing</u> <u>protocols</u> at Northeastern University. This includes outside experimenters that have a sponsored account. Any positive test for experimenters does not need to be shared with NUBIC, as Northeastern University has an internal process that involves tracing and contacting others that might have been exposed.

Restroom Use

The NUBIC facility has a single-occupancy restroom within it, and there is a community restroom by the elevators in the basement as a secondary option. The restroom within the NUBIC facility is available to the participants, experimenters, and MRI operator. However, this access will require disinfection of the restroom <u>afterwards</u> by the person using the restroom. Notices will be posted on the door and inside the restroom as reminders and disinfectant wipes will be provided in the restroom to wipe down critical surfaces, such as the toilet, sink/faucet area, and soap and towel dispensers. In addition, the restroom will be wiped down by the MRI operator in the time between scanning participants. This will allow the NUBIC facility to safely continue to provide access to a single-occupancy restroom with exclusive access for the participants, experimenters, and MRI operator.

Hand Washing and Use of Hand Sanitizers

Frequent hand washing or use of a hand sanitizer is a requirement while in the NUBIC facility. Everyone will wash their hands when using the restroom, but more frequent handwashing is advisable. The testing room (room 072B) has a sink for hand washing. *Figure 5* shows the sink as well as the soap and paper towel dispensers. After using the sink to wash hands there are also



Figure 5: Sink in the testing room (room #072B) that can be used to wash hands. By the sink are a soap and paper towel dispensers as well as wet wipes that can be used as barriers of contact during the hand washing or to wipe down the area after use.

wet wipes provided to wipe down any surfaces that were touched during the hand wash.

The MRI operator, experimenters, and participants will be required to wash their hands or use a hand sanitizer every time they enter the NUBIC facility, since they can access a hand sanitizer or the sink without touching any additional doors or handles (the testing room door is kept open unless occupied by a participant). With this simple rule, they will frequently wash their hands and, critically, will do so before entering the MRI control room as a matter of course.

In terms of existing setup, both the restroom and testing room has an automatic paper towel dispenser and a manual soap dispenser.

PPE for Experimenters, MRI Operator, and Participants

PPE for Experimenters

Masks: All experimenters will wear surgical face masks at all times.

<u>Gloves and disposable gowns</u>: During cleaning and disinfecting of equipment and surfaces and the handling of trash, researchers will wear latex free or equivalent non-allergenic *disposable gloves*. If protection of clothing is needed there are also disposable gowns available.

Keyboard and mouse covering for presentation computer: The presentation computer keyboard should be covered with a single-use *plastic wrap* (saranwrap) when used by the experimenter. The mouse can also have a plastic wrap covering but it is not necessary since the mouse is easy to disinfect after use by wiping it with a Clorox wet wipe.

PPE for MRI Operator During Participant Interactions

Mask: The MRI operator will wear a surgical face mask at all times.

Face shield and disposable gloves in the MRI room: The MRI operator will metal check, escort the participant, and position them on the MRI scanner table. To avoid risk of exposure while in the MRI room with the participant, the MRI operator will <u>at all times</u> wear a *face shield* in addition to a surgical mask, as well as latex or equivalent non-allergenic *disposable gloves*. The gloves will be disposed on exit from the room and hands disinfected with a hand sanitizer. Once the study is complete, the MRI operator enters the MRI room again to remove the participant while wearing the *same face shield* and *new disposable gloves*. The face shield will be reused by the MRI operator for that day, cleaned fully on the outside with disinfectant wipes between uses.

Participant PPE

Mask: All participants will wear a surgical face mask at all times.

<u>MRI-compatible mask</u>: In preparation for scanning, the participant will exchange their surgical mask for an MRI-compatible surgical mask in the changing room and if needed change their clothes into MR-safe clothing provided by the facility. Once they are in the MRI scanner, they are allowed to lower their mask for comfort or if the study protocol calls for it. After the scan at the earliest opportunity, the participant will have to pull the mask back up to fully cover their nose and mouth.

Response button box and emergency squeeze ball covering: During scanning, the response button box is covered with a plastic film and the safety ball is covered with a disposable glove. Both coverings are discarded after the scan.



Figure 6: MRI-compatible mask is constructed in advance by making a small incision to remove the small metal piece that goes over your nose in a surgical mask. The metal piece is half sticking out where it's removed.

Figure 6 shows how the MRI-compatible mask is constructed in advance by making a very small incision above the stitching to remove the small metal nose piece (with a tweezer). These will be constructed in bulk and handed to the participant during their visit. The incision to remove the metal nose piece is above the blue covering and stitching leaving intact the full protection of the mask. Although the metal nose piece is missing, during the MRI scan the subject wears the mask prone so there is no issue of it slipping by gravity.

Disinfecting Procedures

Disinfecting procedures for the NUBIC facility will closely follow the CDC and ACR disinfection recommendations and the NUBIC Research Resumption Application. The scanner schedule is set up such that participants occupy the MRI scanner for a block that is separated from another participant by a temporal gap of one and a half hour.

CDC-approved Clorox disinfectant wipes are available in all rooms. While cleaning and disinfecting and when handling trash, the person cleaning should wear latex or vinyl disposable gloves, and if needed a disposable gown to protect their clothing. Following cleaning, gloves and gown will be removed carefully to avoid contamination of the wearer and surrounding area and disposed in the trash bin. Immediately after removal, the person cleaning will wash their hands with soap in the hand-washing area. Trash bins will be placed in each room for disposal of wipes, paper towels, gloves, and gowns. The trash bins will be emptied every morning during the week.

The disinfecting procedures have two components -(1) procedures conducted on experimenters exiting a scheduled scanner use block, and (2) procedures that take place between participants.

Disinfecting Procedures when Experimenters Exit a Use Block.

On exit from the facility (at the end of a scan) each experimenter will disinfect their area in the MRI control room, which includes the tabletop, hard surfaces on the chair, and other surfaces or equipment they may have touched during the experiment. If the experimenter needs to use the testing room after the scan, they should also disinfect any surfaces touched during that time.

Disinfecting Procedures Between Participants.

Between individual participants, the MRI operator is responsible for disinfecting any (a) accessible knobs, handles, and faucets, including doors to MRI room, (b) the MRI scanner bore (a plastic Swiffer arm and disinfectant wipes are stored in the MRI room), table, peripheral equipment, padding, and head coil, (c) work surfaces by the MRI computer console in the MRI control room including the keyboard and mouse, and (d) the tabletops, chairs, pens, etc. in the testing room.

CDC reference materials on reopening: <u>https://www.cdc.gov/coronavirus/2019-ncov/community/reopen-guidance.html</u>

America College of Radiology (ACR) guidelines: <u>https://www.acr.org/Clinical-Resources/Radiology-Safety/MR-Safety/COVID-19-and-MR-Use</u>

Local Filtration

Inhalation of infected droplets and aerosols present risk for infection. In addition to wearing face masks, maximizing distances between individuals, implementing temporal gaps between principal investigator groups, and screening all individuals for symptoms, another way to mitigate risk is local air filtration with a top-emitting air purifier with a HEPA filter. As labeled in Figure 7, a HEPA filtration unit will initially be placed in the MRI control room (Blueair Blue Pure 411+ air purifier). NUBIC will add filtration units in other rooms that experimenters and participants might occupy.



Figure 7: Location of air purifiers in the NUBIC MRI facility

Appendix: Available PPE, Disinfectants, Local Filtration, and Other Relevant Supplies

PPE

- Vinyl Gloves large
- Latex Gloves medium
- Nitrile Gloves medium and x-large
- Disposable Surgical masks non-MRI safe and MRI safe
- Face shields
- Disposable Gowns

Disinfectants

- Clorox & Lysol wipes
- Alcohol Wipes
- SaniDate Hydrogen Peroxide Wipes
- Sani-cloth PDI wipes
- Hand sanitizer
- Liquid bleach
- Clorox toilet wands

Local Filtration

• Blueair Blue Pure 411+ air purifier – for the MRI control room

Other Relevant Supplies

- Saran wrap
- Non-contact thermometer