UNIT RULES / WORK INSTRUCTIONS FOR MRI FACILITY

Name: MRI-01 Facility management, scope & configuration

Last reviewed: 4th July 2011

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SECTION 1 - INTRODUCTION

PURPOSE
This document specifies the general configuration, scope and management structure of the Swinburne MRI facility, and is useful for providing a general overview of the facility.

SCOPE
This document applies to all staff and students engaged in the Swinburne MRI facility at the Hawthorn campus

DEFINITIONS

<table>
<thead>
<tr>
<th>Word/Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>3T</td>
<td>3 Tesla (magnetic flux density)</td>
</tr>
<tr>
<td>Experimental procedures</td>
<td>MRI pulse sequences that have been designed and compiled on site. These do not include beta versions of sequences provided by Siemens. Only senior and junior MR personnel and healthy volunteers who have previously been vetted by the radiographer may be scanned during experiments.</td>
</tr>
<tr>
<td>Interventional MRI</td>
<td>MR scanning applied to guide a medical (including invasive) procedure, e.g. biopsy or the treatment of a lesion</td>
</tr>
<tr>
<td>MRI</td>
<td>Magnetic Resonance Imaging</td>
</tr>
<tr>
<td>MRI Principal</td>
<td>Executive manager of the SUT MRI facility</td>
</tr>
<tr>
<td>Participant</td>
<td>Any person who is scanned in the SUT MR scanner, they can be either healthy persons or patients with a clinical condition</td>
</tr>
<tr>
<td>SUT</td>
<td>Swinburne University of Technology</td>
</tr>
</tbody>
</table>

CONTEXT

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
</tr>
</thead>
</table>

BACKGROUND

Equipment
The SUT MRI facility is equipped with a Siemens MAGNETOM Trio MR scanner which incorporates a 3 Tesla (3T) superconducting magnet with a cylindrical bore. The Siemens serial number for the Swinburne MR scanner is: 35440

The SUT MRI scanner is equipped with:
- 12 channel RF head coils
- 32 channel RF head coils
- 4 channel RF neck coils
- 24 channel RF spine coils
- RF flex coil kits (for limbs)
Ancillary equipment includes:
- MRI safe trolley
- Eye tracking system
- MRI compatible video screen behind the scanner

**Stakeholder list for MRI facility**

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPsyC Centre Executive Group</td>
<td>SUT</td>
</tr>
<tr>
<td>BPsyC Management Group</td>
<td>SUT</td>
</tr>
<tr>
<td>Barbara Dicker Foundation Board</td>
<td>Independent</td>
</tr>
<tr>
<td>BPsyC Advisory Board</td>
<td>Independent</td>
</tr>
<tr>
<td>BPsyC Director</td>
<td>SUT staff member</td>
</tr>
<tr>
<td>BPsyC Deputy Director</td>
<td>SUT staff member</td>
</tr>
<tr>
<td>MRI Principal</td>
<td>SUT staff member</td>
</tr>
<tr>
<td>BPsyC radiographer</td>
<td>SUT staff member</td>
</tr>
<tr>
<td>BPsyC radiologist</td>
<td>Consultant (0.3 FTE)</td>
</tr>
<tr>
<td>FLSS Laboratory Manager</td>
<td>SUT staff member</td>
</tr>
<tr>
<td>Senior MR personnel</td>
<td>SUT staff members</td>
</tr>
<tr>
<td>Junior MR personnel</td>
<td>Staff and post grad students from SUT and relevant tertiary institutions and medical clinics</td>
</tr>
<tr>
<td>External researchers</td>
<td>External research institutions</td>
</tr>
<tr>
<td>External clinicians</td>
<td>External clinicians</td>
</tr>
<tr>
<td>Cleaning staff</td>
<td>Contract staff</td>
</tr>
<tr>
<td>Facilities and maintenance personnel</td>
<td>SUT staff who may require access for maintenance and repair activities</td>
</tr>
<tr>
<td>Emergency service responders</td>
<td>Metropolitan Fire Brigade – Station No. 18 Hawthorn Victoria Police – Boroondara Uniform</td>
</tr>
<tr>
<td>Floor wardens</td>
<td>SUT</td>
</tr>
<tr>
<td>Participants*</td>
<td>Independent</td>
</tr>
<tr>
<td>Undergraduate students</td>
<td>SUT</td>
</tr>
<tr>
<td>Postgraduate students</td>
<td>SUT</td>
</tr>
</tbody>
</table>

*All persons scanned in the MRI unit will be referred to as participants whether they are healthy controls or patients with a clinical condition*
SECTION 2 - UNIT RULES

1. MANAGEMENT OF THE MRI FACILITY

1.1 Organisational chart

1.2 Roles and responsibilities of the MRI Principal

The MRI Principal is the executive manager of the SUT MRI facility, with the following roles and responsibilities:
1. To ensure that appropriate Unit Rules and Work Practices are established and maintained for the MRI facility, including compliance with all OHS procedures.
2. To ensure that MR personnel are appropriately trained.
3. To supervise the BPscC radiographer
4. To liaise with the Biosafety Committee when required
5. To chair the Neuroimaging Committee
6. To consult with external collaborators about the use of SUT MRI unit.
7. To ensure that all data and records are kept and stored appropriately

1.3 Roles and responsibilities of the BPscC radiologist

1. To review MRI structural scan and provide an appropriate report when clinical follow
1.4 Roles and responsibilities of the BPsyC radiographer

1. To ensure that appropriate Unit Rules and Work Practices are established and maintained for the MRI facility.
2. To conduct the day to day scanning within the MRI unit
3. To ensure that all data and records are kept and stored appropriately
4. To assist with the training of senior MRI staff
5. To review and maintain the SOPs
6. To ensure adequate training and competency for MR personnel and ancillary staff associated with the MRI facility

1.5 Roles and responsibilities for senior MR personnel

Senior MR personnel are SUT staff who are authorised by the MRI Principal to supervise junior MR and non-MR personnel in the MRI facility. They must complete extensive training in MR safety and operational issues as specified in: MRI-03 Training

Roles and responsibilities for senior MR personnel are detailed in:
MRI-05 Safe handling of participants
MRI-06 Safe practices for staff and visitors

While on duty in the MRI facility, all senior MR personnel must uphold MRI facility and Swinburne rules for OHS and supervise others present in the MR facility to do likewise.

The MRI Principal, the BPsyC radiographer and BPsyC radiologist shall be designated as senior MR personnel. Their names, along with any other designated senior MR personnel shall be maintained in a register:
MRI-04 Register MRI facility personnel

1.6 Junior MR personnel

Junior MR personnel are SUT staff (research assistants) or students authorised by the MRI Principal to work in the MR environment under the supervision of a senior MR person.

Junior MR personnel are permitted unaccompanied access throughout Zones III and IV. They are also explicitly permitted to be responsible for accompanying non-MR personnel into and throughout Zone III. However, they are not permitted to directly admit, or be designated responsible for, non-MR personnel in Zone IV.

Junior MR personnel must pass minimal MR safety training to ensure their own safety as they work within Zone III and IV (see definitions) of the MR facility.

While on duty in the MRI facility, all junior MR personnel must uphold MRI facility and Swinburne rules for OHS.

Junior MR personnel may include post grad students.
## 2. SCOPE OF THE MRI FACILITY

### 2.1 Participants

A prospective participant for the SUT MRI facility will be excluded from MR scanning (unless specific ethics approval is granted) if he/she:

1. has any medical implant (except those MRI approved);
2. has retained wires to the body (e.g. temporary pacing);
3. is susceptible to cardiac collapse
4. is at an increased risk of heart attack or other cardiac problems
5. has any cardiac arrhythmias;
6. has impaired thermoregulation;
7. is pregnant;
8. is an infant;
9. is morbidly obese;
10. is nauseated (aspiration risk).

Participants identified in the list below will be treated with caution and may only be scanned after vetting from the attending MR radiologist, the MR Principal, or a specifically designated senior MR personnel following criteria for acceptability predetermined by the MR facility director and documented in MRI-05. This cautionary list incorporates participants who:

1. are non-ambulatory;
2. have a mental health condition (including claustrophobia);
3. are unable to communicate (deaf, non-English speaking, unconscious, neonate, sedated, sleeping);
4. are at risk of epilepsy;
5. are young children (<12 yo);
6. are elderly;
7. are prisoners;
8. are under sedation or anaesthesia;
9. have taken certain medications - beta blockers, calcium blockers, vasodilators, diuretics;
10. are under IV therapy;
11. have old tattoos;
12. have dentures or braces (dental fillings are OK).

If a participant has previously experienced a contrast reaction then he/she may not be given contrast again but may otherwise be eligible for non-contrast based MRI.
### 2.2 Operations

- The main purpose of the MR facility is for internal SUT research. However, it may also be hired out for use by external researchers and clinicians.
- The SUT MRI will not be used in the diagnosis of emergency clinical cases.
- The MR scanner will not be used for interventional MRI procedures unless specific approval has been granted from SUHREC and the Swinburne OH&S Unit.
- Experimental MRI sequences (see definition) may be trialled at the SUT facility subject to specific ethics approval.
- The MR scanner will mostly be used to scan the head/neck regions, but other regions may also be scanned (e.g. with the spine and Flex Coil kits).
- The MR scanner will be operated in normal and 1st level control mode. It will not be operated in 2nd level control mode unless specific SUHREC and OH&S approval has been granted. See Appendix A for a definition of these operating modes.
- The SUT MRI facility may be operated under different shifts, e.g. a day shift (9am – 5pm) and a night shift (5pm – 10pm).

### 3. SAFETY

#### 3.1 General commitment to safety

The MR scanner presents many safety risks, some potentially lethal, to scanned participants as well as staff and visitors in its near vicinity. Accordingly, safe operation of the MR facility shall always be accorded the highest priority in fulfilment of Swinburne OH&S obligations as well as ethical requirements for participants.

A detailed health and safety risk assessment for the MRI facility is provided in: *MRI-09 Health and safety risk assessment*

#### 3.2 Participants

Mandatory work instructions for ensuring the safety of participants are specified in: *MRI-05 Safe handling of participants*

#### 3.3 Staff and visitors

Mandatory work instructions for ensuring the safety of the staff and visitors to the MRI facility are specified in: *MRI-06 Safe practices for staff and visitors*

#### 3.4 Hazard zoning of the MRI facility

Access restriction and zoning of the MRI facility in accordance with ANZCR guidelines (2007) is depicted in Appendix B
### 3.5 Incident register

Details of all accidents or near accidents (i.e. incidents) in the MRI facility will be recorded in:

*MRI-10 MRI incident register*

### 4. TRAINING

#### 4.1 Training requirements

Training requirements for senior and junior MR personnel are specified in:

*MRI-03 Training*

### 5. DOCUMENT CONTROL

#### 5.1 Document control requirements

All policy documents, training records, personnel registers, accident reports, and operational records will be subject to document control as specified in:

*MRI-10 Document control*
SECTION 3 - RELATED MATERIAL

Related Material

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Document Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SECTION 4 - GOVERNANCE

RESPONSIBILITY

<table>
<thead>
<tr>
<th>Owner</th>
<th>BPsyC radiographer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Next review date</td>
<td>10th Feb 2012</td>
</tr>
</tbody>
</table>

VERSION CONTROL AND CHANGE HISTORY

| Version Number | Approval Date | Approved by               | Amendment                                                      |
|----------------|---------------|---------------------------|                                                               |
| R1             | 27/6/2011     | Susan Rossell (MRI Principal) | First released version prepared by Vitas Anderson, Angela McKellar & Susan Rossell |
APPENDIX A – MR operating modes

In addition, the following MR operating modes are defined based on the recommendations of the RANZCR (2007) and/or the UK HPA (2010). These modes relate to the level of physiological stress induced in the participant from exposure to the magnetic/electromagnetic fields of the MR static magnet, the switching coils and the RF coils:

<table>
<thead>
<tr>
<th>Static field (UK HPA)</th>
<th>Normal mode</th>
<th>1st level controlled mode</th>
<th>2nd level controlled mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gradient coil magnetic field levels relative to stimulation level of median PNS threshold (UK HPA &amp; RANZCR)</td>
<td>&lt; 4T</td>
<td>&lt; 8T</td>
<td>&gt; 8T</td>
</tr>
<tr>
<td>Whole body average SAR heating (RANZCR &amp; UK HPA)</td>
<td>&lt; 80%</td>
<td>&lt; 100%</td>
<td>&lt; 120%</td>
</tr>
<tr>
<td>Localised SAR heating (UK HPA)</td>
<td>&lt; 2 W/kg</td>
<td>&lt; 4 W/kg</td>
<td>&lt; 8 W/kg</td>
</tr>
<tr>
<td>head &amp; trunk</td>
<td>&lt; 15 W/kg</td>
<td>&lt; 15 W/kg</td>
<td>&lt; 25 W/kg</td>
</tr>
<tr>
<td>extremities (limbs)</td>
<td>&lt; 15 W/kg</td>
<td>&lt; 15 W/kg</td>
<td>&lt; 25 W/kg</td>
</tr>
<tr>
<td>Rise in core body temperature due to SAR heating (UK HPA)</td>
<td>&lt; 0.5°C</td>
<td>&lt; 1°C</td>
<td>&lt; 2°C</td>
</tr>
<tr>
<td>Maximum local tissue temperature during SAR heating from scanning (UK HPA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td>&lt; 38°C</td>
<td>&lt; 38°C</td>
<td>&gt; 39°C</td>
</tr>
<tr>
<td>Torso</td>
<td>&lt; 39°C</td>
<td>&lt; 39°C</td>
<td>&lt; 40°C</td>
</tr>
<tr>
<td>Extremities (limbs)</td>
<td>&lt; 40°C</td>
<td>&lt; 40°C</td>
<td>&lt; 41°C</td>
</tr>
</tbody>
</table>
APPENDIX B – Hazard zoning of the MRI facility

Zone I
Unrestricted areas

Zone II
Accessible to public, but supervised by MR personnel

Main access point to MRI facility
Resuscitation equipment

Zone III
Restricted access
To MR trained staff

Zone IV
Examination room
Hazardous area
Restricted access
To MR trained staff

Locked door

Zone I
Unrestricted areas