



SOP Title

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Transfer Level 3 Patients to MRI from Red/Amber/Purple zones - please see end of document for applicability to patients in blue zones

MRI is a hazardous environment for both staff and patients necessitating meticulous planning and preparation.

Minimum Personnel

- **Two** “Airway” doctors/ ACCP (one “dirty”, one “clean”). One doctor to be at least ST5 ICU/ anaesthesia or equivalent experience clinical fellow – lower grades may be substituted solely at ICU/ anaesthetic consultant discretion. **Medical escort is not necessary for level 2 patients.**
- **One** critical care nurse.
- **One** critical care technician/ experienced ODP.
- **Four** members of critical care staff in full PPE will be required if the patient is subject to spinal precautions. A radiographer will not necessarily be available to help position the patient particularly after 20:00.

All accompanying personnel should complete both an MRI safety questionnaire for themselves (available from the MRI team) **and** the e-learning for health module “Managing patients undergoing General Anaesthesia in the MRI unit” (further details at the end of this SOP). Staff unfamiliar with the local MRI environment and equipment should also watch the MRI familiarisation video available on the “**Critical Care Cardiff**” YouTube channel **and via** cardiffcriticalcare.co.uk.

All accompanying personnel to remove all metal objects from their person prior to commencing transfer.

Staff cannot enter the scan room if they wear a hood as these are not MRI safe.

Equipment

- Prior to commencing transfer the Anaesthetic machine and patient monitoring in MRI has to be checked by the ITU Technician/ODP (The monitoring in MRI is not standard monitoring- you will need a trained ITU Technician/ODP who is familiar with this, the radiographers are also familiar with this monitoring equipment and can help as well).
- Adequate portable oxygen for transfer to and from the MRI scanner.
- Adequate supplies of drugs and infusions for the duration of the scan. No drugs or fluids are available in MRI.
- **Any infusions that will need to be kept running during the procedure will need to be duplicated with 4 primed infusion lines of length 8 metres (4 infusion lines connected together). You will also need a 50ml syringe of NaCl with a primed infusion line to use as a bolus line during the procedure, in addition you will need a 1000ml bag of NaCl for use as additional flushes. These will all need to be drawn up by a member of the medical team in a blue zone as well as clean pumps brought from that area.**

- **Note the 8 metre infusion line requires 16ml to flush it.**

Patient

- Prior to transfer, ensure that the MRI team have completed an MR safety questionnaire for the patient and are happy that the scan is safe to proceed.
- Disconnect all unnecessary infusions.
- Establish on IV sedation +/- vasopressors as required prior to leaving ICU. The patient should be sedated with IV sedation rather than volatile agents for the scan as it is not possible to adjust the volatile concentration once the patient is undergoing the MRI scan.
- Ensure removal from patient of:
 - Oesophageal Doppler probe
 - PiCCO catheter
 - Swan-Ganz catheter
 - Excess ECG tabs
 - Patches- e.g. Fentanyl/GTN/nicotine
 - Temperature probe catheters
 - In-line suction
 - Hearing aids
 - Dentures
- Any metal in patient's clothing (including the linen tags in patient gowns, blankets and sheets) should be removed
- FloSwitch arterial lines should be substituted for Leadercath or Abbocath arterial lines.
- **The arterial line transducer must be positioned on the patient's midline.**

Process

- The patient is attached to the ITU transfer trolley by an appropriately trained person.
- Prior to leaving ITU, ensure staff in MRI are aware that you are leaving and that the patient is COVID-19 positive or potentially COVID-19 positive so they have enough time to prepare and don PPE. Contact numbers – 47134 and 47133.
- Upon leaving the unit, the bed and transfer trolley wheels and staff shoes will need to be cleaned using clinell wipes. Staff need to change their apron and gloves.
- The “clean” airway Doctor/ACCP will remain in the MRI control room for the duration of the case, they will not be able to assist patient transfer.
- The door to the control room must remain closed at all times, communication to the “dirty” staff will be via telephone or walkie talkies.
- Once in the MRI suite move the patient into the anaesthetic room. Transfer the patient onto the MRI scan bed. Ensure appropriate, MRI conditional monitoring is attached, and MR safety checks are completed. Standard ECG tabs are metallic and will need to be exchanged for MRI conditional ones in the MRI suite.
- Move the patient to just outside the MRI scan room. Do not take the patient into the MRI scan room at this point. Attach the patient to the anaesthetic machine, using the long circuit from inside the MRI scan room. Ensure that the patient ET tube is clamped before connection/disconnection (outside of scan room).

- Sedation should be maintained with an IV agent as this can be controlled from the control room, whereas volatile concentration cannot be changed once the patient is undergoing the MRI scan.
- The anaesthetic machine must not enter the dark grey circle around the MRI scanner.
- Whilst still outside the MRI scan room connect long length infusion lines from the second “clean” set of infusions and the saline infused bolus line to the patient via the hole in the wall (or wave guide) from the MRI control room. Remove infusion lines and pumps transferred with the patient from ICU. **Pumps are not safe to go in the MRI scan room.**
- The patient is then transferred into the MRI scan room itself. Only staff who have completed an MRI safety questionnaire for themselves and the e-learning for health module “Managing patients undergoing General Anaesthesia in the MRI unit” should enter the MRI scan room (see end of this SOP for details).
- The “dirty” team will remain outside the control room until the scan is completed, they should wait in the anaesthetic room with the door closed and communicate with the “clean” team who are responsible for monitoring the patient via telephone and walkie talkies. The anaesthetic room will be cleaned by radiology staff once the ICU team have left the department.
- When the MRI scan is completed “dirty” team should put on clean apron and gloves.
- The patient should be taken out of the MRI scan room, once outside the MRI scan room the patient should be disconnected from the anaesthetic machine and reconnected to the transport ventilator. The ET tube should be clamped whilst the patient is disconnected from the ventilator. All long line infusions running through the holes in the wall/ wave guide of the MRI control room should also be disconnected at this point and the patient should revert to their original infusions and pumps from ICU. The “clean” doctor should disconnect the infusion lines for the patient at this point and they should be pulled through the hole in the wall/ wave guide and disposed of by a member of the dirty team when no longer required.
- The patient should then be moved to the anaesthetic room and transferred back onto their bed.
- Once the patient is safe the team should return to critical care with the patient. There is no need to change any further PPE.
- Patient returned onto bedside ventilator & monitoring, the transfer trolley is cleaned and plugged back in. Emergency drugs returned to fridge.
- Once doffed, the ITU Technician/ODP will need to return to MRI to clean the anaesthetic equipment. The anaesthetic circuit will need to be replaced (cut at appropriate length) and the anaesthetic machine be put back in its usual place in the MRI scan room.
- Radiology staff will take responsibility for cleaning monitoring and putting it back on charge.

Contraindications

Ensure the MRI safety questionnaire is completed by MRI radiographers to ensure suitability of the patient to undergo MRI scan.

Absolute contraindications:

- Confirmed metal fragment in the eye (by orbit X-ray).
- Deep brain stimulator.
- Swan-Ganz catheter or other cardiovascular catheters with metallic parts.
- Obesity – weight over 220 kg, or too physically big to fit in the MRI scanner.
- Uniperc tracheostomy.
- Respirator hoods.
- Flow switch Arterial lines.
- Thermistor urinary catheters.

Potential contraindications:

- Pacemaker/ defibrillator or wires other than sternal wires.
- Spinal cord stimulator.
- Aneurysm clips.
- Bullet/shrapnel injuries.
- Cochlear implant.
- Magnetic dental implants.
- Implanted drug infusion devices.
- Stapes implant.
- Neuro or bone growth stimulator.
- Some surgical clips, wire sutures or screws.
- Ocular prosthesis with metal or magnetic component.
- Penile prosthesis.
- Joint replacement or prosthesis less than 6 weeks old.
- Mechanical or electrical devices inside the body.

For critical care patients who are **definitely** not a COVID risk (**blue patients from a blue area**) please follow the same process. The only unnecessary considerations are the need for a “dirty” team as all escorting team members will be able to enter the MRI control room and it is not necessary to clamp the tube when disconnected from the ventilator. It is also not necessary to clean the bed’s wheels and your shoes on leaving critical care.

The e-learning module “**Managing patients undergoing General Anaesthesia in the MRI unit**” is available at <https://www.e-lfh.org.uk>. You will need to register for a free account which is quick and easy if you do not already have one. Once you have logged in use the search term “MRI safety”. The appropriate module will come up- you have to then select “enrol” and then “play” to access the module. The module takes approximately 45 minutes.

For further information on transfers please refer to the all wales transfer course and guidelines, see link below:

http://www.wales.nhs.uk/sites3/Documents/962/Guidelines%20for%20the%20Transfer%20of%20the%20Critically%20Ill%20Adult_v5.pdf

Appendix 1

MRI checklist for level 3 patients from Red/Purple & Amber zones

Please ensure checklist has been completed prior to leaving critical care unit.

Please ensure all personnel have read the MRI SOP and are competent at MRI transfers prior to transfer - see SOP for further details.

All members of staff should have completed appropriate e-learning for health module for MRI and watched the local MRI familiarisation video on the "Critical Care Cardiff" YouTube channel/ cardiffcriticalcare.co.uk website (See SOP for further details).

<p>Patient details or insert sticker</p> <p>Name:</p> <p>DOB:</p> <p>Hospital number:</p> <p>Address:</p>	<p>DATE & TIME:</p> <hr/> <p>NAME & GRADE:</p> <p>AIRWAY 1:.....</p> <p>AIRWAY 2:</p> <p>TECHNICIAN/ODP:</p> <p>CRITICAL CARE NURSE:</p>
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STAFF	
Are two airway doctors/ACCPs accompanying? (<i>one 'Dirty' & one 'Clean'</i>)	Yes <input type="checkbox"/>
Is one doctor at least ST 5 ICU/Anaesthesia or equivalent? <i>(more junior medical staff acceptable at ICU consultant's discretion)</i>	Yes <input type="checkbox"/>
1 critical care nurse accompanying?	Yes <input type="checkbox"/>
1 critical care technician/experienced ODP accompanying?	Yes <input type="checkbox"/>
Have all members of staff completed an MRI safety questionnaire?	Yes <input type="checkbox"/>
Have all staff removed metal objects from their person prior to transfer?	Yes <input type="checkbox"/>
Appropriate PPE being worn? (NOTE: hoods are not MRI safe)	Yes <input type="checkbox"/>

EQUIPMENT	
Has the anaesthetic machine & monitoring in MRI been checked by the ICU Technician/ODP? (NOTE <i>this must have been done prior to leaving ICU</i>)	Yes <input type="checkbox"/>
Are there adequate oxygen supplies for transfer to and from MRI suite?	Yes <input type="checkbox"/>
Are there adequate supplies of drugs, fluids and infusions for the scan duration? <i>(NOTE no drugs are available in MRI including saline for flushes)</i>	Yes <input type="checkbox"/>
Have you got a 1000ml 0.9% NaCl bag for additional flushes?	Yes <input type="checkbox"/>

Have all required infusions been duplicated with 4 primed lines of 8 metre length?
(see SOP for more details) Yes

Is there a separate 50ml syringe of 0.9% NaCl with primed infusion line available for bolus use? (**NOTE:** Infusions will need to be drawn up from blue zone along with clean pumps. Each bolus requires 16ml flush due to the 8m line length) Yes

Has the patient been established on IV sedation +/- vasopressors? (**NOTE:** it is not possible to change volatile concentration during scan, so IV sedation recommended) Yes

PATIENT

Has the patient had an MRI safety questionnaire completed? Yes

Have the following been removed from the patient:

- Temperature probe catheter Yes N/A
- Excess ECG stickers Yes N/A
- Medication patches (eg Fentanyl/GTN/Nicotine) Yes N/A
- In line suction Yes N/A
- PiCCO catheter Yes N/A
- Hearing aids Yes N/A
- Dentures Yes N/A
- Swann-Ganz catheter Yes N/A
- Oesophageal doppler probe Yes N/A

FloSwitch arterial lines substituted for either Leadercatch or Abbocath lines? Yes

Arterial transducer placed on patient's midline? Yes

PRIOR TO LEAVING UNIT:

Have you got the emergency drug box?
(**NOTE:** Ensure no metal items in box enter MRI scan room) Yes

Have MRI been contacted prior to leaving ICU? Yes

Have MRI been notified of the patient's COVID-19 status? Yes

Only on completion of all of the above, will it be deemed safe to leave Critical Care.

Name of staff member completing form: _____

Signature: _____

Grade/job title: _____

Date and time: _____