

1 MRI RF magnet room door failure workflow

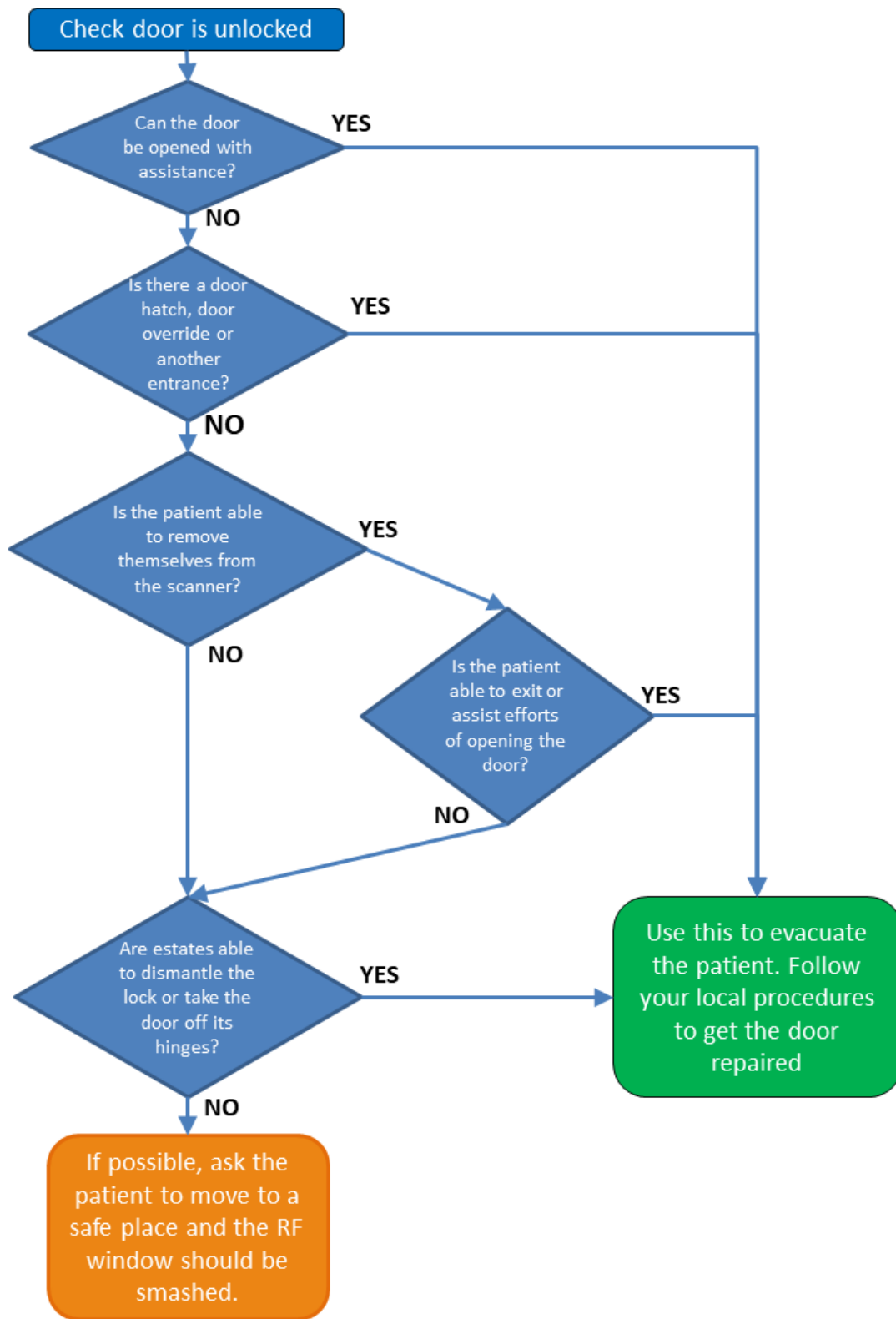


Figure 1. Procedure flowchart for patients trapped in MR scan room due to RF door failure (read full SOP for more detail)

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2 Purpose and scope of procedure

This document is for radiographers in the event that an RF door fails to open with someone trapped in the MR scan room.

3 Background

The majority of MR scan rooms have a single entrance and exit, through a radiofrequency (RF) shielded door. If this door fails to open, patients may become trapped in the room.

There have been a number of reported incidents across the UK where these doors have failed to open. This is most common in doors that use a mechanical handle (as opposed to push/pull doors) but there has also been a report of an object becoming wedged under the door preventing access which could occur with any door design¹.

Whilst this is concerning for any patient, this presents a greater risk in the event of an emergency e.g. a fire, spontaneous magnet quench, cardiac arrest or anaphylactic reaction to a contrast agent. This situation is also particularly problematic for patients with specific monitoring or care requirements such as children, anaesthetised patients or those with breathing difficulties. Patients may also become distressed due to an inability to get out of the magnet bore or magnet room.

At least one scanner vendor advises that contingencies are in place in the event of a door failure¹. The RF window in the MR control room is often suggested as a possible emergency access point. However, the MHRA guidelines state "It will be very difficult to break the control room window as it may consist of four layers of glass with mesh bonded between each of 2 layers"². This was echoed by a RF cage manufacturer representative who stated it "would be quicker to dismantle the door" (George Byers, 2021 personal communication).

4 Recommendations to minimise risk

1. A preventative maintenance schedule should be in place for scanner room doors. This should include repair or replacement of loose or twisted RF fingers, and cleaning of deposits around door frames and floor sills which may cause sticking.
2. Doors with mechanical latches may benefit from the addition of a fixed handle for pushing / pulling, to minimise the effects of fatigue on the latching handle. It should be ensured that any additional work does not affect the integrity of RF shielding.
3. Security locks (e.g. dead bolts) should be separate from the closing/latching mechanism, and should be operable from inside the room without need of a key. **They should not be engaged while the room is occupied as this presents an additional risk of entrapment.** Other security measures (i.e. zoning, access control, physical barriers) should be in place during scanning hours to prevent unauthorised entry to the room.
4. For doors with powered mechanisms (e.g. electronic or pneumatic latches), confirmation should be obtained from the door manufacturer that an emergency override exists that can be applied from outside of the room.

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5. All departments should have a hammer (similar to those near emergency exits on trains) in the event the RF window needs to be smashed.
6. During design or renovation, MRI departments should opt for doors less likely to fail through mechanical fatigue (e.g. push-closed, fixed-handle designs).
7. However, no design is immune from failure or compromise (e.g. jamming due to the presence of a foreign body), therefore designing multiple entrances to the scanner room should be considered where possible.
8. Radiographers must be aware how to remove the patient from the bore from the control room and how to guide a patient to remove each of the coils. If there is uncertainty on how to do this, consider rehearsals and adding instructions to a local variation of this SOP.
9. Discuss this SOP with your local estates contacts to raise awareness and share any feedback
10. Inform MRI Physics if your MRI department requires a local version of this risk assessment and/or SOP.

5 Procedure

1. Make sure the door has not been accidentally locked
2. For MR scan room doors with powered mechanisms, use the emergency override to attempt to open the door. If it is still not opening, seek assistance from another member of staff to see if it can be opened.
3. For push/pull RF doors, seek assistance from another member of staff to see if it can be opened.
4. If the MR scan room has a second entrance or a hatch in the door that can be opened from the outside, use this to enter the room to attend to the patient.
5. If the patient is able, bring out the patient couch and talk the patient through the steps to remove themselves from the scanner. If there is an emergency exit then they should use this. However, if not, they may still be able to assist with dislodging the door.
6. If the door is still not able to be opened, contact your local estates requesting they attend urgently. Depending on the urgency, issue and door type, estates may recommend dismantling the lock or handle or taking the door off its hinges. However, if these cannot be done from the outside, the patient should move to a safe place if possible and the RF window should be smashed.
7. Report the incident through your incident reporting system (e.g. Datix)

References

1. McCann AJ, McKenna L, Wilson PC, Kanal E & McGrath C (2019) "Scanner Room Doors – An Overlooked Hazard in MRI?, IPEM MR Safety Update
2. MHRA Safety Guidelines for MRI Equipment in Clinical Use v4.3 – February 2021

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