

**1 Resolving an MRI RF magnet room door failure workflow**

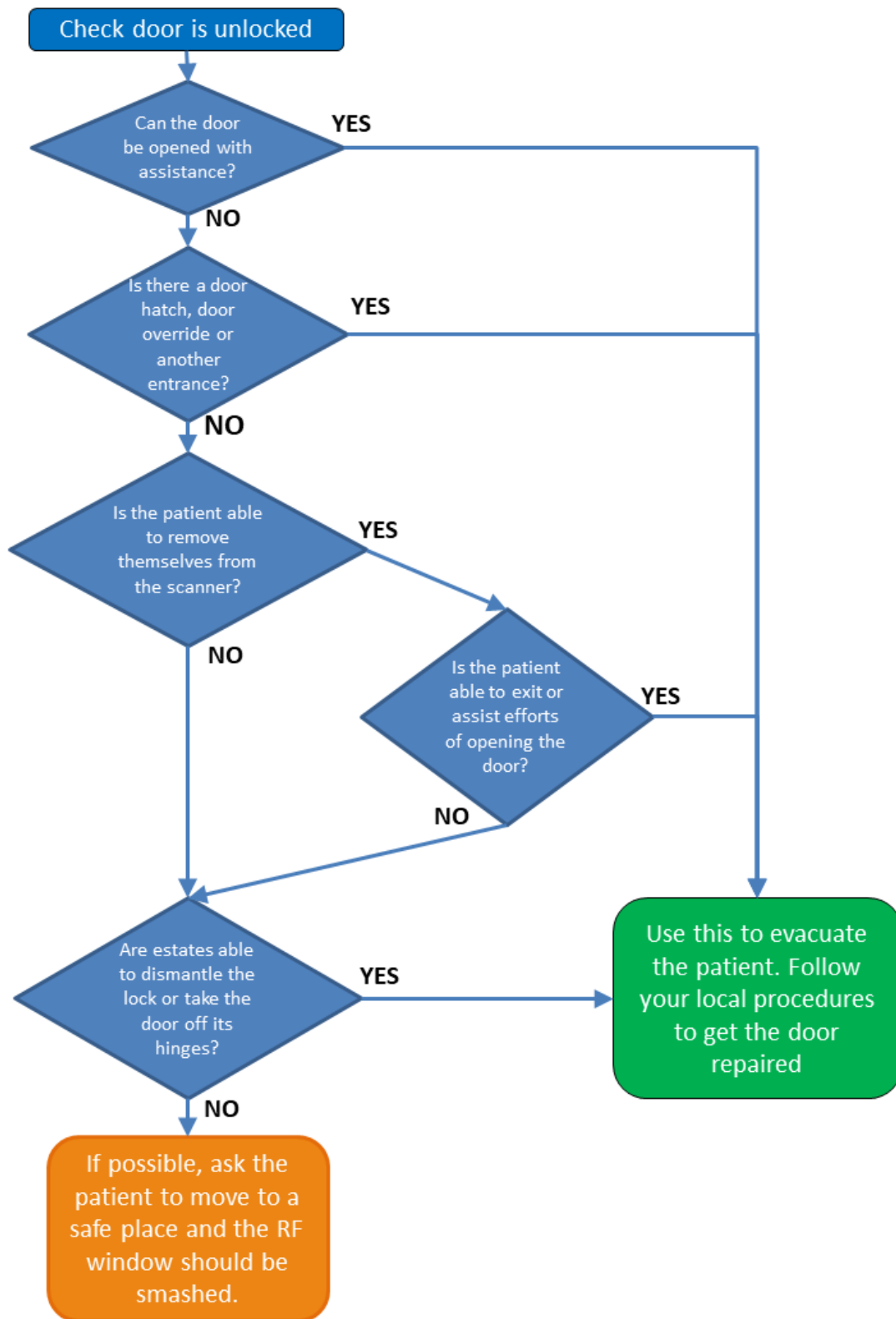


Figure 1. Procedure flowchart for patients trapped in MR scan room due to RF door failure (read full SOP for more detail)

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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 and/or staff may become trapped in the room.

There have been a small but not insignificant number of reported incidents across the UK where these RF doors have failed to open. This is most common in doors that use a mechanical handle, as opposed to push/pull doors but this has happened with the fixed handle door too. There has also been a report of an object becoming wedged under the door preventing access which could occur with any door design<sup>1</sup>.

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, patients from critical care and 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 failure. 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”<sup>2</sup>. This was echoed by a RF cage manufacturer representative who stated it “would be quicker to dismantle the door” (George Byers, Marstrut, 2021 personal communication).

## **4 Recommendations to minimise risk**

1. Staff must raise any issues that might affect the ability for the RF door to open (e.g. issues with door handle or locking mechanism) with radiology management and also inform MRI Physics. It is recommended that the RF door issues are corrected promptly to minimise the risk of the door becoming jammed shut.
2. Sites may opt to have a preventative maintenance schedule in place for scanner room doors. Alternatively, sites may opt to organise repairs on a case by case basis. 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.
3. Security locks (e.g. dead bolts) should be separate from the closing/latching mechanism, and should be openable 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 becoming**

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**trapped.** 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.
5. During design or renovation, MRI departments should opt for doors less likely to fail through mechanical fatigue (e.g. push-closed, fixed-handle designs).
6. However, no design is immune from failure or compromise (e.g. jamming due to the presence of a foreign body), therefore designing multiple exits from the scanner room should be considered.
7. 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.
8. Discuss this SOP with your local estates contacts to raise awareness and share any feedback. To make it easier and quicker for estates to accurately drill the door, sites may wish to take and retain a photo of the opened doors to show the locking mechanism.
9. Inform MRI Physics if your MRI department requires a local version of this risk assessment and/or SOP.

## **5 Procedure to resolve an MRI RF magnet room door failure**

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 and ask them to bring a drill, screwdrivers, a hammer and an axe for the window (as a last resort). Depending on the urgency, issue and door type, estates may recommend dismantling the lock or handle or taking the door off its hinges. Departments may have photos of the opened door to show the locking mechanism. However, if the door cannot be opened or dismantled 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)

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**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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