ENHANCEMENT OF SAFETY BARRIERS IN A MAGNETIC RESONANCE UNIT: A Brazilian Experience


Hospital Sirio-Libanês. Sao Paulo, Brazil
Introduction

Magnetic resonance imaging (MRI) is the result of the interaction of a strong magnetic field with hydrogen protons within the patient’s body.

...which create a situation where a radiofrequency pulse (RF) is applied through RF coils.

The signal emission is provided by the hydrogen protons, and then collected, processed and converted into images.

Under normal conditions of use of the MRI device, the magnetic field never turns off!

MRI components that can be related to adverse effects on patients:

- **RADIOFREQUENCY**
- **GRADIENTS**
- **CRYOGENIC**
- **MAGNETIC FIELD**
- **CONTRAST AGENTS**

Main adverse effects related to the magnetic field: attraction/twisting ferromagnetic objects; changes in the functioning of non-compatible electronic devices; tissue burnings, etc.

Source: Mazzola et al

Source: Haik et al

Source: Mailonline
Aiming to prevent these events, the American College of Radiology has defined four safety zones within MRI facilities:

- **Zone I**: UNRESTRICTED AREA
  - Access and circulation allowed.
  - Free of magnetic field interaction.

- **Zone II**: CONTROLLED AREA
  - MRI Safety Screening Questionnaire
  - Near the exam room.

- **Zone III**: RESTRICTED AREA
  - ATENTION!!!
  - Patient preparation for exam
  - Near magnetic field

- **Zone IV**: RESTRICTED AREA
  - DANGER!!! Access with authorized personnel only
  - Inside exam room

Some adverse events have also taken place at our institution in the recent years.
Objectives

To describe our institutional experience in optimizing safety barriers in a MRI unit of a Brazilian private hospital (8 MRI machines).

To discuss the importance and the feasibility of the educational and security initiatives in order to prevent accidents and to provide a better experience for patients and healthcare professionals.
Methods

This project was developed from September 2019 to September 2021. The following security barriers were implemented:

- **Barrier 1** - The scheduling team asks a series of standardized questions to ensure that the patient have no contraindications to the MR scan.

- **Barrier 2** - The patients is oriented to fill a security questionnaire, to change clothes and to remove disposable metallic belongings (zone I).
Methods

- **Barrier 3** - A first professional check all the patient’s answers in the safety questionnaire (zone II). Some answers can require personalized investigation.

- **Barrier 4** - A second professional recheck the identification data and the safety questionnaire before entering the examination room with the patient (zone III).

The safety questionnaire is an important barrier to identify risk factors to adverse events and MR contraindications. In this case, the pointed answer must be further investigated.
Whenever necessary, additional security measures were taken in our service, such as the installation of a security camera at MR waiting room after an wheelchair accident.

The patient registration system was fed with data related to MRI safety, such as the size of implants and devices.

The investigation of the compatibility of materials and devices was carried out by consulting the MRI safety website.

https://www.mrisafety.com
A *educational training* was carried out annually, first for all employees in the radiology department and then for other care professionals who could have indirect (such as the cleaning team) or intermittent (such as transport team) contact with the MRI unit.

Adverse events were recorded in our *incident notification system (INS)*, available in our institution’s internal platform.

Data was collected through the INS, and we were able to compare the data related to the events that occurred before and after the implementation of our security project and educational training.
Results

The impact of our interventions was evaluated by the number of adverse events recorded in our incident notification system, before and after the described safety barriers and educational training program.

Number of MRI scans per year

Number of occurrences by MRI Security Failure

Source: Sirio Libanes Hospital
A very significant reduction of the number of adverse events was observed following our institutional effort to optimize safety barriers and to educate care professionals in our MRI unit.

According to our experience, all patients must be screened individually for safety issues before undergoing a MRI scan, if possible by more than one professional.

Moreover, educational activities related to MRI safety must be carried out periodically to all the care professionals who are directly involved in patient care in MRI units (not only healthcare professionals). These initiatives must also include professionals who have indirect or intermittent contact with the MRI unit.

Conclusions

Take home message

Safety in the MR environment is a institutional duty!

Each institution should elaborate its own security and education plan (following international guidelines) in order to prevent adverse events and to provide a better experience for patients and healthcare professionals.

Contact: suzana.olsozza@hsl.org.br

References


