

This review address a number of areas of safety concern in MRI, emphasizing those that gain increased importance for high-field (≥ 3 Tesla) MRI systems. First, the effects of magnetic fields on the patient will be discussed, including the main, B_0 magnetic fields. Topics shall include physiological concerns and regulatory guidelines applicable to the magnitude of the magnetic field strength. Second, the biological effects of radiofrequency (RF) magnetic fields will be addressed, introducing the concepts of eddy currents, specific absorption rate (SAR) and the Food and Drug Administration's (FDA) guidelines that deal with this topic. Finally, physiological consequences of pulsed gradient fields will be covered, including the audible noise generated by the gradient coils, nerve stimulation experienced in gradient-intense pulse sequences and the FDA's guidelines regarding limitations and control of dB/dt. This presentation will also include a discussion on approaches to managing the MRI system's magnetic fields effects on the environment, including unanticipated flying objects (UFOs), the ACR Zone system for MRI suite plans and a detailed review of patient contraindications for MRI studies. Patient safety issues also include the description of the risks of using gadolinium (Gd)-based and superparamagnetic iron oxide (SPIO) contrast agents. A brief discussion of the risks to pregnant patients and clinical MRI workers will also be included. Finally, the causes and dangers of superconducting magnet malfunction, focusing on cryogen boil-off, safety switch design, spontaneous quenches and controlled quenches will be undertaken.

At the end of this presentation the attendee should be able to:

- discuss the major biological effects that can be arise from the magnetic fields produced by high-field MRI systems.
- enumerate the safety concerns engendered by the used of exogenous contrast agents in MRI.
- explain the safety features that should be incorporated in the design of the MRI suite to reduced adverse events due to UFOs, patient heating and magnet quenches.