

Fabius MRI Room Layout Planning

Conditions surrounding the delivery of anesthesia in the MRI room differ from those in the OR. MRI-specific anesthetic management includes a special room layout plan involving the patient's treatment path. This is particularly true for intensive care patients and children.



The spatial layout for the MRI room is often affected by the existing infrastructure; therefore, optimized planning “from scratch” can be difficult or impossible. Due to that fact, it is integral to consciously consider and integrate all current and future needs when planning the MRI area. The principle: What was not planned and implemented initially will be difficult to realize in the future and quite expensive.

General planning takes into account the needs of outpatient, ambulatory, as well as disabled patients. It is important to check whether care is going to include bed-bound, intensive care patients, and children. If interventions are to be expected, detailed planning is mandatory.

ANESTHESIA IN THE MRI ENVIRONMENT

Individual aspects impacting the safe delivery of anesthesia in the MRI environment differ from the operating room. In the OR, the patient is usually relaxed, intubated, and monitored within close proximity to the medical staff.

Additionally, there are appropriate guidelines and recommendations set forth by

national professional societies covering safety and equipment in the operating room; however, they do not apply to the use of anesthesia in the MRI area.

Despite that fact, anesthesiologists continuously face a variety of challenges in the MRI environment:

- The patients are usually responsive.
- Almost all of the patients breathe spontaneously.
- Children are only moderately sedated for the exam period.
- The MRI system requires MRI-suitable devices (ventilators, patient monitoring, perfusors/syringe pumps).
- Due to a strong magnetic field and high frequency, equipment such as ECG electrodes and patient cables is not identical with the usual or familiar standards.
- The ECG quality in the MRI environment is not comparable to other routine monitoring processes.
- Communication with the supportive care personnel outside the MRI room is difficult since an independent intercom system (except via the MRI) is not available.

HOLDING AREA

The term “holding area” describes the preparation / induction / recovery rooms.

This area is required for all patients who need medical care involving anesthesia and is normally a quiet, private area for the patients.

In terms of layout, the “holding area” is to be designed to meet the following criteria:

- Access from the exterior hallway (access corridor, waiting area) is possible with a bed and
- sufficient space is available to transfer the patient onto an MRI stretcher.
- Built-in storage cabinets with a sink are mandatory.

Additional space is required for a mobile anesthesia machine (Fabius MRI), MRI-compatible patient monitoring, and an anesthesia cart. A standard configuration anesthesia machine and patient monitor can be mounted on the wall.

The gas supplies for O₂, AIR, N₂O, and scavenging (vacuum, AGSS) are mandatory and should be equipped with wall or ceiling connections.

An adequate number of wall sockets are also important since many devices for use during MRI feature battery chargers.

In addition to a standard room light fixture, an additional, pivotal “OP light” must be provided to make it possible, e.g., to “hook up” the patient.

MRI ROOM LAYOUT

Today, MRI systems don’t need to be housed in a separate building. They can be situated in radiology departments, or in specific departments such as neurology/ stroke, children’s clinics, or within the OR area.

Since an MRI room is basically a “shielded cabin,” all subsequent installations are very expensive or not feasible at all.

Spatial conditions impacting the idealized workflow should be clarified prior to MRI room installation.

Each MRI installation is associated with a project plan. The project manager, who coordinates the participating companies such as the cabin builder company and other installation companies, plays a key role in the project planning process.

The required size of an MRI room is specified by the manufacturer, with a minimum size required for each MRI variant. In addition, planning must consider fixed and mobile facilities.

BARRIER-FREE WORKFLOWS

The standard equipment for MRI system operation includes a wall shelf, a sideboard for MR coils, and a contrast injection system.

The following focal points must be considered to maintain smooth daily workflow and high-quality patient care:

- Barrier-free access for and with a patient.
- General patient monitoring in the MRI room.
- Positioning of additional devices or monitoring devices with the necessary medical connections.

BARRIER-FREE ACCESS

Barrier-free access for a patient means a direct route to the MRI machine from the changing room using an MRI-approved wheelchair or trolley.

Additionally, mobile monitoring devices connected to the patient (monitors, pumps, ventilator/anesthesia machine) must be transported with the patient to the MRI room. This fact should prompt an analysis of the width of doors en route to the MRI room.

VISUAL PATIENT MONITORING

Generally, video monitoring should be

ensured during the MRI procedure. In addition, the MRI system should be positioned in such a way that a direct line of view is established from the control area (through the window) into the „MRI tunnel.“ This is an important aspect, especially in cases where the patient is ventilated.

POSITIONING „ADDITIONAL DEVICES“

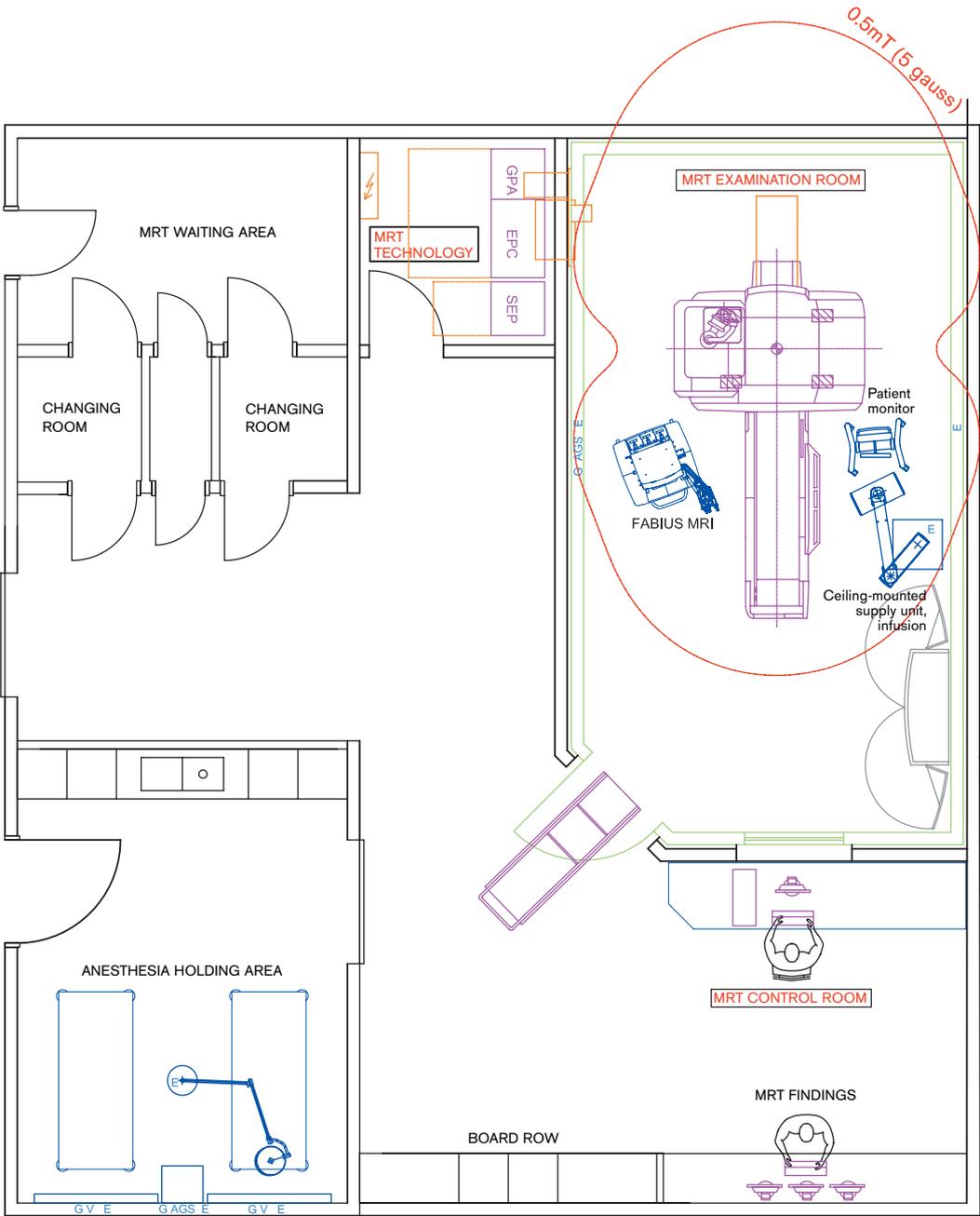
Radiologists consider all additionally required equipment “additional devices.” These “additional devices” are MRI-approved anesthesia equipment, patient monitors, and pump systems.

The lines leading from these devices to the patient have different lengths; moreover, third-party devices have different approved distance limits to the static magnetic field of the MRI machine. This required distance from the MRI device is noted by field lines (mTesla or Gauss). The strength of every magnet can be measured and noted in this manner. The required distance is defined in the project documentation of the relevant MRI installation. It is important to apply one or more field lines on the floor as a permanent marking (e.g. 20 mTesla).

Once the position for the respective devices is determined, the supply connections are defined:

- Gases: O₂, AIR, N₂O;
- Anesthetic gas scavenging
- Sockets/outlets
- Other push-in connectors

If a different position is possible, (e.g. access via the head area), the same connections should be used again. The length of power cables should not exceed 5 meters.



(LINEA IM)* SOLA 300 (LINEA IM)*
FABIUS TIRO WAND

Legend
 G = gases (N2O, O2, Air)
 V = vacuum
 AGS = anesthetic gas suction
 E = electric current circuit(s)

* Wall-mounted supply unit
 Manufacturer: VTS Deutschland GmbH

Schematic depiction of a spatial infrastructure based on a Siemens project plan.

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