

## PRIMER: ANESTHESIA FOR MRI

The MRI suite is a hazardous location because of the presence of a very strong and continuous magnetic field. Dangers of this energy source include acoustic noise, localized heating, accidental projectiles, quench. There are significant challenges to anesthetic administration, monitoring capabilities, and patient observation.

Zone I = Public areas

Zone II = Patient preparation area

Zone III = Restricted patient observation area just outside of the scanner room

Zone IV = Scanner room, **absolutely no ferromagnetic objects in this zone**

It is important to note that the magnet **is always on**, whether or not the patient is being scanned. Gauss units quantitate the magnetic field. The border into Zone IV represents the threshold of  $\geq 5$  Gauss units. The strength of the field varies within the scanner room

Patient screening:

- Patients will be screened for any ferromagnetic objects or implants. Review and confirmation of the screening document (located under Form Browser) will be part of the anesthesia pre-assessment
- Most implanted medical devices are absolutely contraindicated (some newer Medtronic devices are MRI compatible)
- Total joint prosthesis are not ferromagnetic, however older surgical clips and some orthopedic screws are ferromagnetic

Anesthesia equipment and supplies:

- A standard anesthesia cart will be in Zone III. It can **not** be taken into Zone IV
- An MRI-safe trolley cart can be used to bring supplies from the anesthesia cart into Zone IV
- The anesthesia machine is in Zone IV. It is MRI-conditional, not MRI-safe; this means that the machine can only be in the areas of Zone IV where the field is weaker
- There is a Gauss meter on the anesthesia machine. It should always read below 300 Gauss, which is the case when the machine sits directly alongside of the scanner cylinder at either end. (The field is strongest along the axis of the cylinder)
- Standard oxygen tanks **cannot** go into Zone IV. The MRI-safe O<sub>2</sub> tank on the MRI anesthesia machine is made of aluminum

- Special MRI-safe laryngoscope blades and handles are in the anesthesia cart. Standard blades, handles and the Glidescope cannot be used
- The crash cart and defibrillator are immediately available, but they **cannot** be taken into Zone IV. The patient must be removed from the scanner room for resuscitation
- Standard monitors cannot be used in Zone IV. The MRI-safe wireless monitor system does not associate with our EMR
- A syringe pump will be in Zone III. It **cannot** be taken into the scanner room.
- Standard ETTs, LMAs, and stylets are MRI-safe
- Needles (including those for IVs) should remain in Zone III. Needless cannulas are available on the anesthesia cart. In an urgent situation, needles can be brought into the scanner room with supervision of the MRI tech
- The nearest MH cart is in Endoscopy

#### Workflow:

- Anesthesia will be attending all MRI scans that are ordered as GA, MAC, moderate IV sedation, or deep IV sedation; the actual anesthetic plan will be determined at the time of the pre-anesthesia assessment, regardless of how the scan was ordered
- Minimal IV sedation does not require anesthesia attendance (see the SWG sedation policy for the definition of minimal sedation)
- Cases are to be scheduled for weekday day shift only. The need for anesthesia after hours will necessitate patient transfer
- Make sure an IV is ordered before the case
- Ideally an anesthesia team from Endo will be assigned
- There is no Pixsys in MRI. Bring scheduled drugs from a Pixsys and a drug tray from the OR satellite pharmacy
- Anesthesia personnel must remove all ferromagnetic items from their person. These items can be kept in Zone III
- Induction of anesthesia occurs in the scanner room with the patient on an MRI-safe cart, and the IV bag on an MRI-safe pole. (No standard beds, carts, chairs, or IV poles are permitted in Zone IV)
- Anesthesia personnel observe the patient in Zone III during the scan. A computer terminal is available for charting
- For medication administration from Zone III, a second IV tubing (along with propofol tubing) will be threaded through the copper pass-through between Zones III and IV, and piggybacked into the patient's existing IV
- Call an anesthesia tech for emergence and transport assistance. Have them bring appropriate monitoring. (An MRI tech will notify PACU)
- Patients will recover in the main OR PACU. Use the old-ER elevators located between radiology and the new ED

MRI contrast – Gadolinium - contraindicated in CKD

Quench – if the magnet is suddenly shut down (for whatever reason), there is a release of the magnet's stored energy as heat. This heat vaporizes its coolant (liquid helium). Helium gas can cause loss of O<sub>2</sub> from scanner room. If this occurs, get the patient and personnel out of scanner room stat, and provide the patient with supplemental O<sub>2</sub>