Introduction to Magnetic Resonance Imaging

- Safety & QC -

Safety Concerns

- RF Heating
- RF Burns
- Nerve Stimulation
- Hearing Loss
- Pacemaker Failure
- Impalement
- Frostbite
- Nerve Stimulation
Safety Concerns

- **Imaging Coils** - RF Heating
  - RF Burns
- **Gradient Coils** - Nerve Stimulation
  - Hearing Loss
- **Magnet** - Pacemaker Failure
  - Impalement
  - Frostbite
  - Nerve Stimulation

RF Heating

- **Cause** - Pulse sequence does not adhere to FDA guideline
  - (System failure or improperly entered patient weight)
- **Prevention** - Periodic system maintenance.
  - and care in entering patient weight.
RF Burns

Cause - Imaging coil failure.

Prevention - Periodic system maintenance.

Nerve Stimulation

Cause - dB/dt of magnetic field too large.

Prevention - Keep dB/dt below FDA guidelines.

Cause - Magnet quench or magnetic field gradients are switched on and off too quickly. Associated with rapid imaging sequences.

Prevention - Keep dB/dt below FDA guidelines. Periodic maintenance and maintain cryogen levels.
Hearing Loss

Cause - Gradient switching noise.

Prevention - Use hearing protection.

Pacemaker Failure

Cause - Moving through a magnetic field induces a current in wires. When those wires are in a pacemaker, the unit fails and the wearer dies.

Prevention - Do not allow people with pacemakers to enter into magnetic fields greater than 5 Gauss.
Impalement

Cause - Ferromagnetic objects being attracted by the magnet.

Prevention - Do not bring ferromagnetic objects near the magnet or image people with ferromagnetic implants.

Frostbite

Cause - Superconducting magnet quench.

Prevention - Periodic maintenance and maintain cryogen levels.
Phantom

An anthropogenic object that can be imaged to test the performance of the magnetic resonance imaging system.