CRYOGEN & MAGNET QUENCH SAFETY & PROCEDURES

PURPOSE

- To ensure the safety of patients and personnel as it pertains to the cooling of the magnet.
- To define magnet quenching and specify procedures for personnel.

PROCEDURE

- The superconducting magnets used in MRI scanners require cryogenic gases for cooling. The principle of a superconducting magnet is to create an environment that does not require a continuous supply of electricity to maintain magnet strength. The windings in the core of the superconducting magnet must be cooled to below 9.5 K (-440° F). This is accomplished by surrounding the windings with a dewar (sophisticated thermos bottle) filled with liquid helium (which has a boiling point of 4.2 K). Liquid nitrogen has a boiling point of 77 K and is also used to cool the magnet.
- Cryogens require replenishment because of boil-off. This operation must only be performed by appropriately trained personnel following safety procedures. Safety glasses and heavy gloves are required. Refer to the safety documentation supplied by the system vendor.
- A magnet quench occurs when the magnet windings temperature increases above 9.5 K. This results in boiling off of the cryogen turning it into gas (100-150 L in less than 1 minute) which must be vented to the outside atmosphere. The continued increase in temperature of the magnet windings increased resistance to flow of electricity and abrupt loss of magnet field strength. Refer to the safety procedures relating to a quench from the system vendor.
- The magnet quench button should only be activated when immediate shutdown of the magnetic field is required:
  - Forces directly related to the magnetic field are causing patient or personnel injury.
  - A fire in the scanner room cannot be extinguished/contained with an MR conditional fire extinguisher.
  - Any other situation that requires an immediate shutdown of the magnetic field as opposed to a normal, controlled "ramp-down" of the magnetic field.
- If a quench happens:
  - Immediately remove the patient from the magnet room.
  - Evacuate all personnel and patients from the area.
  - Immediately contact MRI service personnel, the Imaging Manager and Risk Management.
  - Initiate downtime equipment protocol.
- For sites that have a pressure equalization door:
  - The area around the pressure equalization door will be taped off to prevent blocking of the door and/or injury to persons standing near door.
  - Signage will be posted to explain the safety process and to ensure the area is kept clear.