University Health™	**Policy #: Rad Proc 14. 4. 10**
SUBJECT: Thermal Burns	**Effective: 10/1/2013** **Revised: 2/2015: 2/2017**
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PURPOSE: Damaged radiofrequency coils, physiologic monitors, electronically-activated devices, and external accessories or objects made from conductive materials have caused excessive heating, resulting in burn injuries to patients undergoing MR procedures. Heating tends to be problematic with objects made from conductive materials that have elongated shapes or that form loops of a certain diameter. Excessive heating may also occur in cases of limbs or other parts of the patient's body being in direct contact with the transmit body radiofrequency (RF) coil or other transmit RF coils. Technologists must take precautions to prevent thermal burns.

POLICY:

1. Prepare the patient for the MR procedure by ensuring that there are no unnecessary metallic objects contacting the patient's skin (e.g., drug delivery patches with metallic components, jewelry, necklaces, bracelets, key chains, etc.).
2. Prepare the patient for the MR procedure by using insulation material (i.e. appropriate padding) to prevent skin-to-skin contact points and the formation of "closed-loops" from touching body parts.
3. Insulating material (minimum recommended thickness, 1-cm) should be placed between the patient's skin and transmit RF coil that is used for the MR procedure (alternatively, the transmit RF coil itself should be padded). There should be no direct contact between the patient's skin and the transmit RF body coil of the MR system. This may be accomplished by having the patient place his/her arms over his/her head or by using elbow pads or foam padding between the patient's tissue and the transmit RF body coil of the MR system. This is especially important for MR examinations that use the transmit RF body coil or other large RF coils for transmission of RF energy.
4. Use only electrically conductive devices, equipment, accessories (e.g., ECG leads, electrodes, etc.), and materials that have been thoroughly tested and determined to be safe or otherwise acceptable for MR procedures.
5. Carefully follow specific MR safety or MR conditional criteria and recommendations for implants and devices made from electrically-conductive materials (e.g., bone fusion stimulators, neurostimulation systems, cardiac pacemakers, cochlear implants, intracranial pressure monitoring catheters, etc.).
6. Before using electrical equipment, check the integrity of the insulation and/or housing of all components including surface RF coils, monitoring leads, cables, and wires. Preventive maintenance should be practiced routinely for such equipment.
7. Remove all non-essential electrically conductive materials from the MR system prior to the MR procedure (i.e. unused surface RF coils, ECG leads, EEG leads, cables, wires, etc.).
8. Keep electrically conductive materials that must remain in the MR system from directly contacting the patient by placing thermal and/or electrical insulation between the conductive material and the patient.
9. Keep electrically conductive materials that must remain within the transmit body RF coil or other transmit RF coil of the MR system from forming conductive loops. Note: The patient's tissue is conductive and, therefore, may be involved in the formation of a conductive loop, which can be circular, U-shaped, or S-shaped.

10. Position electrically conductive materials to prevent "cross points". A cross point is the point where a cable crosses another cable, where a cable loops across itself, or where a cable touches either the patient or sides of the transmit RF coil more than once. Even the close proximity of conductive materials with each other should be avoided because cables and RF coils can capacitively-couple (without any contact or crossover) when placed close together.
11. Position electrically conductive materials (e.g., cables, wires, etc.) to exit down the center of the MR system, *not* along the side of the MR system or close to the transmit RF body coil or other transmit RF coil.
12. Do not position electrically conductive materials across an external metallic prosthesis (e.g., external fixation device, cervical fixation device, etc.) or similar device that is in direct contact with the patient.
    a. Allow only properly trained individuals to operate devices (e.g., monitoring equipment) in the MR environment.
13. Follow all manufacturer instructions for the proper operation and maintenance of physiologic monitoring or other similar electronic equipment intended for use during MR procedures.
14. Electrical devices that do not appear to be operating properly during the MR procedure should be removed from the patient immediately.
15. Closely monitor the patient during the MR procedure. If the patient reports sensations of heating or other unusual sensation, discontinue the MR procedure immediately and perform a thorough assessment of the situation.
16. RF surface coil decoupling failures can cause localized RF power deposition levels to reach excessive levels. The MR system operator will recognize such a failure as a set of concentric semicircles in the tissue on the associated MR image or as an unusual amount of image non-uniformity related to the position of the transmit RF coil.

In the event of a thermal burn, the following steps must be taken:

1. Notify the MR medical director and MRI manager of the incident.
2. Pt will be evaluated by Radiology Resident designated by the MR medical director.
3. The Radiology Resident will assess the burn and make necessary treatment decisions.
4. A variance will be submitted.