Guidelines to Prevent Excessive Heating and Burns Associated with MRI*

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To prevent excessive heating and possible burns in association with MRI procedures, the following guidelines are recommended:

1. The patient should change into a gown or other appropriate attire that does not contain metallic material.
2. Prepare the patient for the MRI 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.).
3. Prepare the patient for the MRI 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.
4. Insulating material (minimum recommended thickness, 1-cm) should be placed between the patient's skin and transmit RF coil that is used for the MRI 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.
5. 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 MRI procedures.
6. Carefully follow the MR Safe or MR Conditional criteria and recommendations for implants and devices made from electrically-conductive materials (e.g., bone fusion stimulators, neurostimulation systems, cardiac devices, cochlear implants, etc.).
7. 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.
8. Remove all non-essential electrically conductive materials from the MR system prior to the MRI procedure (i.e. unused surface RF coils, ECG leads, EEG leads, cables, wires, etc.).
9. 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.
10. Keep electrically conductive materials that must remain within the transmit body RF coil or other transmit RF coil 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.
11. 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.

12. 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.
13. 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.
14. Allow only properly trained individuals to operate devices (e.g., monitoring equipment) in the MR environment.
15. Follow all manufacturer instructions for the proper operation and maintenance of physiologic monitoring or other similar electronic equipment intended for use during MRI procedures.
16. Electrical devices that do not appear to be operating properly during the MRI procedure should be removed from the patient immediately.
17. 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.
18. Do not permit patients to wear clothing items (e.g., sportswear, underwear, yoga pants, socks, etc.) that have metal-based fibers.
19. Closely monitor the patient during the MRI procedure. If the patient reports sensations of heating or other unusual sensation, discontinue the MRI procedure immediately and perform a thorough assessment of the situation.

The adoption and regular practice of these guidelines will ensure that patient safety is maintained, especially as more conductive materials and electronically-activated devices are used in association with MRI examinations.

[*Additional information may be found in the *Safety Info* section of www.MRIsafety.com]