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# Survey of Infection Control in the MRI Environment

*- Lack of Infection Control Procedures in MRI May Place  
Patients and Staff at Risk -*

By

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## **Author's Bio:**

Dr. Peter Rothschild has been involved in both clinical interpretation and research in MRI for over 25 years. He has been instrumental in researching the lack of infection control in MRI and alerting the MRI community. He formerly served as Medical Director of the Radiologic Imaging Laboratory at the University of California at San Francisco, where he helped develop the first commercially available Open MRI scanner. He edited the first textbook on Open MRI, authored numerous papers, secured medical patents and is a sought after speaker who lectures on MRI and its future. Dr. Rothschild also authored the groundbreaking paper; "*Infection Control in MRI*" published in Aunt Minnie a web portal for Radiology. Dr. Rothschild is a Board Certified Radiologist and served as an Adjunct Assistant Professor of Radiology at the University of California at San Francisco. He earned his MD degree in 1981 from the University of Louisville, School of Medicine, in Louisville, Kentucky. He is founder and president of Patient Comfort Systems, a California corporation that is dedicated to patient comfort and safety.

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## **Introduction**

This first of its kind pilot study was prompted by both the recent report of Methicillin-resistant Staphylococcus Aureus (MRSA) being cultured from within magnetic resonance imaging (MRI) facilities and the death of Nile Moss, an immunosuppressed but otherwise healthy 15 year old boy. This patient died from MRSA pneumonia following an outpatient MRI<sup>1 2 3 4</sup>. The goals of the study were to determine the state of infection control in the MRI environment and what, if any, obstacles would be faced by patients or referring physicians when they attempt to determine the state of infection control at an individual facility. The study not only evaluated if basic infection control procedures were in place at hospital MRI facilities and outpatient imaging centers, but also whether there was a difference between the two. Ultimately, the goal of the survey was to determine to what extent written infection control policies are in place and whether these procedures were available to the MRI technologist and used in daily practice.

Written infection control procedures have been definitively shown to reduce the risk of infections when followed properly<sup>5 6 7</sup>. Without these written procedures, there can be no consistent infection control, even at the most basic level. The results of this survey clearly show that, in the absence of written policies, any infection control being performed is solely the result of the preferences and training (or lack thereof) of whoever is operating and/or is responsible for the MRI facility.

There is no better need to conduct this survey than the demonstration of the lack of even the most basic infection control at many MRI centers. The most egregious example of this is that of the MRI technologist who, while responsible for various MRI facilities, expressed her concern about patient complaints of the foul smells emanating from their torn and contaminated pads. The directions she received from the administrator were simply to spray air freshener into the tears and on the pads. Obviously, this is an incredibly inappropriate “solution” to an extremely dangerous public health risk.

# Background

## **What the public does not know about MRI centers (Lack of certification for the MRI operator)**

A background explanation as to why MRI operators' training in the United States has been brought into question stems from a legal loophole in the requirements established to become an MRI "operator". While individuals must be certified as a "Radiologic Technologist" (referred to as technologists) following an accredited education program of at least two years, in order to legally operate any x-ray equipment (i.e., ionizing-based equipment), this is not the case for MRI examinations. Since the MRI procedure does not involve the use of ionizing radiation, there are no federal requirements either to be certified or even properly trained before becoming an MRI operator. Until recently, there were no state requirements for any sort of training or certification to operate an MRI and currently only one state, West Virginia, requires an MRI operator to be licensed.

These MRI operators are often incorrectly referred to as "technologists" by the imaging center staff, but this is misleading because they are not Registered Radiologic Technologists. Consequently, any individual, trained or untrained, can legally operate an MRI system. A person without even a high school diploma could be operating the MRI system that scans you or your family member, and you wouldn't be aware since he or she is still called a "tech".

Thus, this loophole in the law potentially places patients at risk, especially those with a greater susceptibility to antibiotic resistant strains of staph infections or "super-bugs" such as Methicillin-resistant Staphylococcus Aureus (MRSA).

Due to overwhelming concern for patient safety related to untrained personnel operating sophisticated medical devices, several states have recently begun closing this loophole. New Mexico recently passed a law, scheduled to become effective July 1, 2009, to require MRI operators to be licensed by the state, as has been the case in West Virginia for several years. Due to these safety concerns, several other states are considering adopting similar regulations for MRI operators, although closing this loophole may take years. This issue will be discussed in detail latter in this article.

## **Superbugs**

The term “superbug” is used commonly to describe those infectious agents, bacteria, virus, etc., which have mutated to become resistant to most antibiotic or other agents now in use, so their treatment is extremely difficult once an infection has begun. While the average patient may be able to effectively resist and fight off an aggressive superbug, the immunosuppressed patient is missing critical immune system components, placing him or her at severe risk for deadly consequences from an infection. This was the case for the MRSA patient fatality that has been associated with an MRI procedure. Typically immunosuppression is the result of AIDS, chronic steroid use, chemotherapy, radiation therapy, bone marrow transplant, premature birth, autoimmune diseases such as lupus, and numerous other causes. Most worrisome are the many people who are immunosuppressed but have never been diagnosed with any systemic disease, and consequently do not know that they have a deficiency in their immune system. Therefore, it is prudent to assume that every patient undergoing an MRI is, or could be, immunosuppressed. Importantly, written infection control procedures must be established, practiced, and used for every MRI patient to ensure safety.

Clearly, individuals who may have limited training will likely have a limited understanding of infection control. This clearly necessitates an even greater need for written procedures along with the extra training and education required to ensure everyone's safety. This survey demonstrated that without written procedures, there is no assurance of any infection control.

## **Lack of Infection Control Regulations**

What also will come as a surprise to most patients is that outpatient imaging centers are totally unregulated when it comes to infection control. In contrast, hospital facilities are routinely subjected to Joint Commission inspections, approximately every 2 years. The Joint Commission is increasingly interested in evaluating MRI centers for infection control procedures, especially in light of recent incidents such as the death of the MRSA patient relative to an MRI examination. However, to date, the Joint Commission rarely certifies or even inspects outpatient imaging centers, especially facilities that are not affiliated with a hospital. Unlike restaurants, which are all required to pass Health Department inspections on a regular basis, these outpatient imaging centers never undergo a health inspection or any other type of inspection. It is a difficult concept for patients and their referring physicians to grasp the fact that these outpatient imaging centers are totally unregulated. The assumption, especially by the public, is that since it's a medical facility it must be clean and safe. Unfortunately,

nothing is farther from the truth. The potentially filthy conditions of many MRI centers will shock the public. The Joint Commission has also expressed their concern over this lack of infection control in outpatient MRI suites and is devoting resources to evaluate the MRIs during their inspections<sup>8 9</sup>.

## **Untrained Personnel –Saves Money but Puts Patients at Risk**

Unfortunately, many outpatient imaging centers may use minimally trained or totally untrained personnel to operate their MRI systems, instead of hiring registered radiologic technologists. This allows these centers to run at much lower costs and more easily fill manpower shortages. One example is the small, low patient-volume MRI center that can't afford two trained registered technologists to operate the MRI systems. The centers often cross train a receptionist or a tech assistant with essentially no education in the field of MRI or infection control to cover days when the primary technologist is sick or on vacation. These lower paid employees are also often used to cover lunch breaks. No MRI center wants to stop scanning patients simply because their only technologist is at lunch or calls in sick.

## **Mobile MRIs – The Area of Greatest Concern**

Mobile MRIs (MRIs on semi-tractor trailer trucks that pull up to a hospital or doctors office) potentially pose an even greater risk. These MRIs may travel hundreds of miles each day to different small community hospitals or doctors' offices to scan patients. It is extremely difficult and expensive to hire trained registered radiology technologists willing to also drive hundreds of miles. The solution for many mobile MRI companies, especially the smaller ones, has been to simply cross-train the truck driver to scan the patients. Unfortunately, most truck driving schools have no infection control training.

As a result of all of the above factors, it is little surprise that personnel at the outpatient imaging centers that utilize a mobile MRI company may be poorly trained, or more often, completely untrained when it comes to infection control. It is possible and has been observed that the current lack of regulation of imaging centers and mobile MRIs means that many of those individuals operating sophisticated MRI systems are not properly educated and trained, and may not even have a high school degree. Thus, an infection control policy needs to be an absolute requirement for every MRI center.

## **Survey Goals**

To determine the prevalence of this problem, this informal nonscientific survey evaluated the following three groups:

1. The number of hospitals whose MRI facility has a written infection control policy with which the MRI operators are familiar.
2. The number of outpatient MRI centers having a written infection control policy with which the MRI operators are familiar.
3. The number of centers at which the front desk or MRI operator indicates some type of infection control policy, but in reality none actually exists

This last group was very concerning because this will give patients and referring physicians the false sense of security that a policy exists.

Forty-seven (47) outpatient imaging centers and fifty-three (53) hospital MRI facilities were contacted.

By speaking with front desk personnel, MRI operators, or center managers about their infection control policy, every attempt was made to determine if a written infection control policy existed and if so, if it was followed by every operator and for every patient.

## **Initiation of the Survey**

This study was initiated as a simple nonscientific survey; however it quickly turned into “an evade the question” situation especially for the outpatient imaging centers. Many of these centers simply stated, “Of course it is clean. Why do you ask such a question?” Many were also defensive as well as being evasive. The survey attempted to contact the chief MRI technologist or center manager, since the receptionists were universally uninformed.

Unfortunately, many of the technologists and managers at the outpatient imaging centers were not much better informed.

## Questions Asked

The surveyor was trained to ask further questions if any facility acknowledged that they had an infection control procedures policy.

First, “Are these procedures in writing and posted where all can see them?” A written policy buried in an employee handbook, as many claimed, is useless and therefore not protecting patients.

Second, “What exactly does your policy say?” The surveyor was listening for answers such as washing their hands between patients, cleaning table pads between patients, etc. Even if there was a written infection control procedures policy at these centers, if the operator had no idea what procedure the policy contains, there effectively was no infection control policy. These infection control procedures must be used with every single patient. To make exceptions because the patient seems healthy or does not appear to be infected is unacceptable.

## Responses from MRI Operators

The responses were quite revealing of the level of concern for infection control. The following are just a few of the responses.

- “I’ve never seen one, but we must have something somewhere.”
- “Nobody ever asked that before.”
- “Why do you want to know?”
- “I think we have one of those infection control policies; it’s somewhere in our employee manual.”
- ”We do not need one (referring to an infection control procedure). It is all common sense.”
- “I was told we have one, but I have never seen it.”
- “We have no time to deal with all this type of stuff.”
- “This infection control stuff is way overblown. The MRI is completely safe.”
- “We have never had an infection problem at our facility; therefore we don’t need an infection control policy.”

# Results

The results were reviewed to get an approximate idea of the infection control at one hundred (100) randomly chosen freestanding and hospital MRI facilities.

Fifty three (53) hospital based MRI centers and forty seven (47) outpatient free standing MRI centers were contacted by telephone.

They were asked,

1. "Do you have written infection control procedures and are they posted where everyone can see?"
2. "If so, do you follow them for every patient?"
3. "What do your infection control procedures say?" and "Are your procedures specific for the MRI suite?" For this question, the surveyor was listening for whether they washed their hands after each patient, whether they cleaned pads between patients, etc.

If the respondent claimed to have written procedures, the surveyor asked if they could be either faxed or emailed to him.

Of the 53 hospital MRIs, 33 claimed to use a generic hospital policy to maintain cleanliness in their MRIs and 2 claimed to have infection control policies specifically written for MRI. Employees at 6 facilities volunteered that they wash their hands after each patient, and 7 volunteered the name of the product they use to clean the MRI suite. Three of the hospital based MRIs answered, "Why do you want to know?" and two answered, "Nobody ever asked that before." Four stated, "There must be something," but never stated that there actually was a policy or written procedures. In four instances, the first several employees contacted on the phone did not know whether there were any procedures, and the surveyor was eventually transferred to a manager who assured the caller that there were indeed written procedures. These four were counted as having procedures, despite the fact that many employees were obviously unaware of them.

Only three of the 53 hospitals stated that their infection control policy was posted for employees to view in or near the MRI suite.

The surveyor subjectively felt that 17 of the 53 hospitals were clean enough that he would be comfortable as a patient at the facility.

Of the 47 outpatient imaging centers, 18 stated that they had an infection control policy, which includes the 5 who stated that infection control was in their employee manual. None of the respondents from the outpatient imaging center volunteered that they washed their hands after each patient, nor did any respondents from outpatient imaging center volunteer the name of their cleaning solution. Employees from two of the outpatient imaging centers stated that their policy was posted on the wall.

The surveyor subjectively felt that eight of the outpatients imaging centers were clean enough that he would be comfortable as a patient at the facility.

Each of the respondents from both groups (hospitals and outpatient imaging facilities) who stated they had an infection control policy were asked to fax or email it. Not a single procedure was received. Only two email responses and one fax were obtained. One of the email responses was asked for more information from the surveyor. The other email response and the fax received stated that nothing could be emailed or faxed.

Type of facility	# of facilities	# stating they have written policy	# stating policy clearly posted	# stating “we wash our hands after each patient”
<b>Hospital</b>	53	35	3	7
<b>Outpatient</b>	47	13 (18*)	2	0

Note\*: The larger number of 18 includes the 5 who stated infection control was in the employee manual

## Discussion

There was a substantial difference between the responses from the outpatient MRI facilities and the hospital-based MRI facilities. The personnel at hospital-based facilities were clearly more educated on infection control and had a much higher number of infection control policies, many of which were in writing. However, these were more general policies and covered the entire radiology department, or in some cases the entire hospital. It became clear that many of these personnel had been trained in infection control procedures and it was very reassuring that policies were in place and being followed.

The major area lacking was that of specific policies for infection control for the MRI system room and MRI system itself, especially addressing the bore of the scanner. Only two of the hospitals claimed to have cleaning procedures specific for the MRI environment.

Six responders in the hospital group, and none of the responders in the outpatient facility group, spontaneously stated, "We clean after each patient." Likewise, seven responders in the hospital group, and none of the responders in the outpatient group, spontaneously volunteered the name of the cleaning agents used in their MRI facility.

There were also other interesting differences discovered in this survey. If the surveyor called after 4 P.M. local time, suggesting that the "day" MRI technologists were off duty and the night technologists were covering the imaging center, there was a clear drop in the level of understanding of infection control. This makes sense since the least experienced technologists may work the night shift. Also the managers are normally not present at night so consequently the level of infection control may be less.

## **The Joint Commission Influence**

The Joint Commission and infection control officers in the hospital had a great influence on these facilities, and this was clearly demonstrated by the fact that several hospital staff indicated that in order to maintain their accreditation, they must maintain an infection control policy. In general, the hospital staff was more likely than the outpatient facility staff to take time to explain the infection control procedures and to reassure the surveyor that these facilities were clean and safe.

A recent example demonstrating a hospital staff's level of understanding occurred at a hospital facility where a patient with MRSA urinated on the pads. The pads were torn and frayed and so judged to be uncleanable. Very quickly these pads were replaced with new pads containing antimicrobials. There was not only a concern for the safety of future patients, but also a concern that the hospital could be inspected by the Joint Commission at any time and that they could be cited for lack of cleanliness and infection control. Additionally, medical-legal concerns of the possibility of a patient becoming infected may have also played a role in this decision.

## **Outpatient Facilities**

Outpatient imaging centers were a very different story. It was clear that infection control was of secondary importance and often totally left up to the judgment of the operator of the MRI system. Not a single outpatient facility volunteered any infection control procedures that the MRI system operators use between patients such as washing their hands or sanitizing between patients.

## **Conclusions**

To the average person who is not involved in the MRI business, these results are shocking; but to MRI operators and center managers it may come as no surprise. Clearly infection control has been overlooked at these centers due to many factors.

- Lack of education and understanding.
- Fear of exposing the problem.
- Financial pressure to increase patient throughput.
- Lack of any regulation or inspections, especially at outpatient facilities.
- Poor quality of equipment such as torn, frayed and damaged pads.
- Difficulty cleaning the MRI equipment, particularly the bore of the MRI system.
- Costs of training and pad replacements that are not in their budget.

The public is very concerned over lack of infection control and the spread of MRSA.

If nothing else, the findings of this survey should act as a wakeup call for MRI facilities to immediately consider this issue seriously

The most important part of the solution is a well thought-through written infection control procedure posted and implemented throughout the MRI facility <sup>10</sup>. Additionally, these procedures must be followed with every

patient, period. There also must be clear consequences if they are not followed.

An infection control procedure will be the first step to assure the public that steps are in place to prevent another patient from being infected in association with the MRI environment.

## **11 Steps to Prevent Infections in the MRI**

### **Environment**

#### ***Recommendations for Infection control procedures for MRI Facilities in Hospitals and Outpatient Centers***

1. Develop an appropriate written infectious control policy to include MRI cleaning procedures as well as a cleaning schedule and have it posted throughout the MRI facility.
2. Implement a mandatory hand washing / hand sanitizing procedure between each patient not only for MRI technologists, but for all others who come into contact with patients.
3. Clean the MRI system, tables, inside the bore of the MRI system and any other items that come into contact with the patient. Infection control experts recommend this be done between each patient.
4. Clean all comfort pads and positioning sponges with an approved disinfectant. Infection control experts recommend cleaning after each patient.
5. Periodically inspect the pads and positioning pads with a magnifying glass, particularly at the seams, to identify fraying or tearing. If present, the pads should be replaced.
6. Regularly check all padding material with an ultraviolet (black) light and make sure that any biological material detected on the pads can be removed
7. Replace damaged or contaminated pads with new pads incorporating permanent antimicrobial agents.
8. Use pillows with a waterproof covering that is designed to be surface wiped. Replace pillows when their barrier is compromised.
9. Promptly remove any body fluids and then surface disinfect all contaminated areas.
10. If a patient has an open wound or any history of MRSA or other infection:

- a. Gloves and gowns should be worn by all staff coming in contact with the patient. These barriers must be removed before touching other areas not coming in contact with the patient, i.e. door knobs, scanner console, computer terminals, etc.
  - b. The table and all the pads should be completely cleaned with disinfectant before the next patient is scanned, if it is not already being performed between each patient. For patients with any known infectious process, add 10-15 minutes onto the scheduled scan time to assure there is enough time to thoroughly clean the room and all the pads.
11. All furniture should be periodically cleaned. Ideal surfaces are those that are waterproof and easily wiped. Infection control experts recommend this be done between each patient.

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