

Preventing Infection in Imaging

Hospital and community acquired infections are a major and growing problem in the United States. The primary culprit for these infections is methicillin resistant staphylococcus aureus (MRSA). Unfortunately, imaging departments and free-standing imaging centers can be a hub for highly communicable diseases. This was dramatically demonstrated by the drug-resistant TB patient who made headlines in May 2007.

Although he was strictly quarantined in a specially designed hospital room with a specialized ventilation and filtration system, he was allowed to leave his room for one purpose--to visit the radiology department for a CT scan. Clearly the imaging department did not have this degree of protection in place.

This is not an isolated event. Most patients with dangerous infections will have an imaging procedure performed within the imaging department or imaging center some time during their course of treatment where the safeguards against infection are often not present.

Methicillin Resistant Staphylococcus Aureus (MRSA)

While this patient's virulent strain of TB is rare, many communicable diseases are not. The most worrisome is MRSA, so named for its resistance to all penicillins including methicillin. Therefore, MRSA is among those infectious diseases commonly known by the term "super bug".

The most common source of transmission of MRSA has been by direct contact with asymptomatic carriers or people who have active MRSA infections. In 1974, MRSA accounted for only 2% of the total staph infections; in 1995 it had risen to 22% and by 2004 had reached 63% of all staph infections. MRSA may be community acquired (CA-MRSA) or hospital acquired (HA-MRSA).

The morbidity and mortality of these bacteria is staggering. On average, hospitalizations for the treatment of MRSA versus other infections have a length of stay approximately 3 times longer and are 3 times more costly. Additionally the risk of death is 3 to 5 times greater.

A major concern for imaging centers is that MRSA can be carried by asymptomatic patients. Therefore, any patient lying on an imaging table without a known history of MRSA could actually be a carrier spreading these aggressive bacteria. Worldwide, it is estimated that up to 53 million people are asymptomatic carriers of MRSA; of these it is estimated that 2.5 million reside in the United States.

Center of Disease Control (CDC) and Joint Commission on Accreditation of Healthcare Organizations (JCAHO)

The CDC has developed guidelines for environmental infection control within healthcare facilities. The CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC) issued a 249 page document extensively detailing their recommendations concerning, in part, the principles of cleaning and disinfecting various surfaces even including carpeting and cloth furnishings. A chapter focused on laundry and bedding discusses how mattresses and pillows become contaminated and harbor bacteria, viruses and parasites and even how healthcare workers are becoming infected.

They recommend:

"Standard mattresses and pillows can become contaminated with body substances during patient care if the integrity of the covers of the items is compromised... A linen sheet placed over the mattress is not considered a mattress cover. Patches for tears or holes in mattress covers do not provide an impermeable surface over the mattress...Wet mattress in particular can be a substantial environmental source of microorganisms. Infections and colonizations by MRSA have been described."

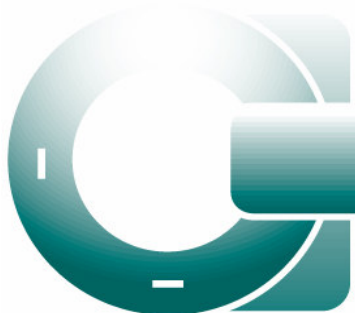
This report also went on to describe contaminated textiles and fabrics.

"2. Epidemiology and General Aspects of Infection Control

Contaminated textiles and fabrics often contain high numbers of microorganisms from body substances, including blood, skin, stool, urine, vomitus, and other body tissues and fluids. When



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textiles are heavily contaminated with potentially infective body substances, they can contain bacterial loads of 106–108 CFU/100 cm² of fabric. Disease transmission attributed to health-care laundry has involved contaminated fabricsBacteria (Salmonella spp., Bacillus cereus), viruses (hepatitis B virus [HBV]), fungi (Microsporum canis), and ectoparasites (scabies) presumably have been transmitted from contaminated textiles and fabrics to workers via a) direct contact or b) aerosols of contaminated lint generated from sorting and handling contaminated textiles.”

JCAHO has placed infection control as a special focus during inspections. This is due to the great concern over the spread of MRSA and other aggressive bacteria.

Areas of Risk

The area of greatest challenge for preventing MRSA and other infections is the MRI suite. Due to the high magnetic field, most centers and hospitals do not allow cleaning crews to enter, and pads are rarely if ever cleaned. There are often over 20 table pads and positioners as well as multiple pillows. The solution has always been to put a clean sheet over the table pads and a pillowcase over pillows. This clearly will not protect the patient from soiled and contaminated pads. Due to the volume of MRI and CT scans performed yearly, the probability is that many of these patients are infected with or carry MRSA. Additionally, studies have shown that approximately 30-50% of all people carry less virulent staphylococcus on their skin, which could also pose a risk of infection.

Another area of exposure to infectious agents is the use of IV contrast material for both CT and MRI, which significantly increases the risk of blood contamination. The simple task of removing a needle from a patient's arm and placing it into the sharps container has great risk. Blood can drip from the needle or from the puncture wound onto the pads, table and floor. This blood can often be unnoticed leaving a contamination risk.

There is also concern for spreading infectious bacteria by direct contact both among the imaging staff and the patients within the imaging department or center. MRSA can be acquired through a simple cut or other break in the skin that may not be noticed during a busy day. Therefore, hand-washing between patients as well as hand sanitizer use for the entire staff is of crucial importance.

Bacteria and Table Pads

One much overlooked concern is that of torn and frayed pads used in imaging departments and centers. Once the covering material has been breached, pads cannot be properly cleaned and should be immediately removed and replaced.

In the late 1980's and early 1990's when most of the pad systems were developed, they were not designed to take the wear-and-tear of five to ten thousand patients a year for so many years. As a result, pad coverings have worn out, making them impossible to clean.

Only in the last 5 to 10 years have hospital-acquired infections become so significant, before which time there was very little concern for contamination and MRSA had far from today's prevalence. Therefore, pads on most tables do not incorporate newer technologies developed to assist infection control. Permanent antimicrobial agents should be incorporated into all table pads and positioners. For added protection, the seams of the table pads should not only be tightly sewn but also welded closed. The integrity of these seams is crucial in protecting patients.

Black Light Detection of Body Fluids

Taking a technique from forensic science and popular television shows such as CSI, pads may be tested using a black light to detect contamination by body fluids. A black light provides light in the ultraviolet wavelengths that is especially sensitive in detecting biological material such as blood, fingerprints, body fluids, etc. Biological material remaining on the pads will light up under black light exposure.

The next step is to clean these pads using a standard hospital cleaning solution. If the black light continues to show biological material, this may indicate that the covering material has been breached, allowing body fluids to seep into the fabric itself and possibly penetrate to the underlying foam. This demonstrates the necessity for pads and positioners to contain permanent antimicrobial agents.

Conclusion

Protecting patients and staff takes a concerted effort and diligence by the entire staff. The cleanliness of free-standing imaging centers and hospital imaging departments is crucial in reducing the spread of MRSA and other acquired infections. There is no question that this issue has not received the attention of the imaging community it deserves. There is growing concern that at least some of the spread of infectious agents could be coming from outpatient imaging centers and imaging departments in hospitals. Everyone must do their part to combat these dangerous diseases. Now is the time to institute new procedures to prevent the spread of these infections.

High Field & Open MRI

Has Implemented the Following Procedures to Protect Patients:

1. All technologists must wash their hands or use hand sanitizer between patient exams. This has been proven to be the most important way to prevent spread. (If you ever have an imaging study, observe whether the technologist washes their hands or uses hand sanitizer. This will give you a general idea of their infectious disease control policy.)
2. All pads and positioners have been replaced with ones that have incorporated permanent antimicrobial agents. (The pads that come from the manufacturers of the MRI, CT, etc. rarely incorporate antimicrobial agents.)
3. Table pads and positioners are cleaned with an appropriate disinfectant.
4. Regularly check all padding material with a black light and make sure that any biological materials detected on the pads are removed.
5. Regularly inspect pads and positioners with a magnifying glass, particularly in the regions of the seams, to identify fraying or tearing. If present, pads are replaced.
6. MRI tables, tourniquets and any other items that come into contact with a patient are cleaned regularly.
7. Replace all pillows every few weeks at a minimum and have water proof coverings containing antimicrobial agents.
8. All sheets, scrubs, and patient gowns are laundered by an approved laundry service that will wash the clothes in very hot water to kill all germs.
9. Promptly remove body fluids, and surface disinfect contaminated areas.
10. Periodically clean the upholstered furniture and furnishings in the patient dressing rooms and waiting areas.
11. Limit patient exposure to flowers and plants because they can harbor bacteria.
12. Have adequate pest control in place and restrict areas for eating.
13. If a patient has an open wound or any history of MRSA:
 - a. Gloves should be worn by staff coming in contact with the patient. They should 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. For patients with any known infectious process, add 10-15 minutes onto the scheduled scan time to allow enough time to thoroughly clean the room and all the pads.
14. Any time a patient has an “accident”, the pads and table are thoroughly cleaned before the next patient is scanned.
15. A policy similar to most surgery departments requiring any surgery performed on an infected patient to be scheduled only at the end of the day, thus allowing a thorough cleaning of the room and remaining unoccupied over a prolonged period of time allowing the air filtration system to remove any airborne contaminants.
16. All patients are changed into clean scrubs to decrease risk to bacteria transmission from patients’ clothes.

