Dear Joseph,

It seems that more and more attention is being paid to the inherently dangerous environment in and around your Magnetic Resonance Imaging facility. Unfortunately, the additional attention hasn't been of the positive nature. While historically the vast majority of these incidents, near misses and close calls were taken care of on-site without the requirement for disclosure, the industry is beginning to realize the benefits of acknowledgement and collective remedial action.

The articles in this month's newsletter address situations in which oversight and recommendations are being provided by professionals in the industry and at the state agency level. In addition, our first-hand exposure to a recent incident in the United Kingdom demonstrates how, despite utilizing all conventional screening procedures,
accidents can still easily occur. It is through incorporation of the latest ferromagnetic screening technology, such as Metrasens' Ferroguard, in conjunction with thorough screening protocols, that facilities can provide their patents and staff with the level of safety expected of the industry.

Having the Right Tools for the Job

**Ferromagnetic Screening Devices = Safety Tools**

Conventional methods of screening patients prior to imaging include a review of the patient's history, patient interviews and in some cases a requirement for patients to change into hospital gowns. Even when all of these procedures are precisely followed, it can not be guaranteed that all potentially dangerous ferrous items present on the patient have been accounted for.

As demonstrated during a recent customer visit, facilities may be doing everything "right," however the developed screening tools utilized have proven to be inadequate or too heavily reliant on the answers provided by the patient. Ferromagnetic Detection Systems provide personnel with a comprehensive understanding as to the presence of objects in a way that enhances existing screening procedures.

**Case Study Incident**

Metrasens Ltd (based in Malvern, Worcestershire, UK with offices in Chicago, IL) were asked to provide a demonstration of their Ferroguard Beacon System as part of a safety update and review of safety technologies ahead of a decision to purchase a second MRI scanner for the facility.

During the product demonstration, a 9 year old child presented to the unit for a head scan. Following existing screening procedures including a full clinical history check with her mother, the child was taken into the MRI room for her scan. After a short while and before a scan could begin the child became very distressed and agitated. Fighting through the tears, she complained to the staff of pain in her nose and around her face. Further gentle questioning raised the potential of a foreign object from a child's toy "hidden" up each nostril.

It was decided to screen the child using the Ferroguard Beacon system which incorporates a series of illuminated lights and audible alarm to indicate the presence of ferrous material to varying levels of sensitivity. The child was asked to approach the portal created by the systems two independent sensing poles from a distance of approximately 10 feet. As the child got to within 6 feet of both poles the lights changed color from Green (indicating no moving ferrous material present) very quickly through Amber (indicating a small ferrous signal) to Red (indicating a strong ferrous signal which would be dangerous if ignored). The results were conclusive indicating the presence of...
a very strong ferrous signal at a distance of 6 feet from the sensing pole. As conventional screening had failed to identify the presence of this object, it was decided an x-ray would be needed to confirm the findings of the Ferroguard Pre-screen test.

**Case Study Results**

Results from the x-ray later confirmed the presence of two small magnets stuck either side of the nasal septum. These had apparently been placed there by the child some six months earlier. It later emerged the child had removed them from a toy she received at Christmas. These components were attracted to one another and became stuck in the nasal passage, causing the child to become too frightened to tell her parents of the event.

Following the incident, Mr. Tim Wicker, Superintendent Radiographer MR at Russell's Hall Hospital stated.. "If this site had the Metrasens units installed then we would have detected the presence of the magnets BEFORE the patient entered the scan room and would have prevented the pain caused to the patient by being in the scan room".

Russell's Hall Hospital has an exemplary safety record, however on this occasion normal screening methods failed to identify the presence of potentially dangerous ferrous material. The use of the Ferroguard Beacon System clearly demonstrates how helpful this new technology can be as an adjunct to normal screening practice where foreign objects may be hidden from view, or a clear clinical history is difficult to obtain.

Metrasens Ltd are now working with Russell's Hall Hospital to ensure it maintains its exemplary MRI safety record and indeed hope by integrating both Pre-screen and Door Entryway operational modes of its Ferroguard Beacon technology into the unit make it the safest MRI facility in the country.

A growing number of UK and US facilities have already installed Ferroguard systems either as a door Entryway Systems or Patient Pre-Screen units. Many more hospitals and MR facilities are now actively considering taking advantage of this flexible technology.

Metrasens Ltd are global leaders in ferromagnetic detection technology, having won a UK National Medical Technology Award in 2006 for Business Start-Up and in May 2008 were awarded the UKTI Innovative Exporter Award.

**Dangerous Missiles**

**Recent Article in Imaging Technology**

Attempts to physically remove attracted objects are difficult and dangerous. Often, several workers are required to remove even small objects. Sudden movement during extraction can cause personnel injury. At times, wrench assistance is required. Typically in such situations, the magnet will be required to be ramped down or quenched to remove the attracted object. Cryogen replacement for this process can cost up to $20,000. Scanner repairs and lost scanner revenue associated with MRI projectile accidents may increase expenses to $250,000 or more.

Gas cylinders are a particular risk in the MRI environment. Such cylinders can weigh
from 30lb to 150lb when full. Ferromagnetic gas cylinders are especially dangerous in a magnetic environment, where they can be uncontrollably accelerated. Potential hazards include gas-propulsive missile impaction, explosion and fire. If the cylinder regulator valve is damaged on initial impact, the cylinder may propel away from the magnet, only to return for a second impact.

Patients and personnel are at great risk in such events. Often, the patient is sedated or under general anaesthesia. Attendant personnel are typically unfamiliar with the MRI milieu, where ferromagnetic objects may unknowingly be introduced into the magnetic field. For example, an oxygen tank may be hidden in the patient's bed sheets.

Based on the known risks of ferromagnetic cylinders, the safety programme for gas tanks in the MR environment includes procedures and training in the appropriate handling of cylinders and their exclusion from magnetic attraction. Many sites use in-line gas ports to avoid mobile oxygen cylinders entirely. Aluminium cylinders are an alternative solution. Because of the possibility of an erroneous cylinder exchange, it is best to secure all cylinders to the ground.

A 60-year-old man was awarded $100,000 in damages after sustaining facial fractures when he was struck by a size H oxygen cylinder while undergoing an MRI examination. This cylinder is the largest tank available at 23.5cm in diameter and 129.5cm long.

A loaded H cylinder and trailer may weigh 165lb. In this case, the MR imaging warning sign attached to the door was not visible because the door was propped open. A delivery person arrived with the replacement H-cylinder tank, which he brought into the MR suite on a cart. The cylinder was placed approximately 20ft (6m) away from the 0.6T unshielded magnet. The magnetic force suddenly pulled the cylinder off the cart.

The cylinder hit the MR table and then the fibreglass front cowling of the magnet, and lodged in the centre of the bore of the magnet, above the patient, with the safety shield portion of the tank against the patient's jaw. The MR technologist was unable to quench the magnet. Because the quenching apparatus failed, three radiology staff members finally extracted the patient through the opposite end of the magnet with great difficulty.

Read the entire article at Hospital Management.net

Pennsylvania Patient Safety Advisory

March 2009

In 2008, 148 reports were submitted to the Pennsylvania Patient Safety Authority identifying a variety of problems related to inadequate screening practices of individuals for metal exposure or orders written for MRI scans of patients with MR contraindications (e.g., permanent pacemakers). Most of the reports involved patients with implanted devices such as pacemakers, cardiac defibrillators, and aneurysm clips entering the MRI scanner room or MR personnel realizing just before patients entered the MRI scanner room that the patients had implanted devices. Other reports identified MR screening forms with incorrectly or inadequately answered questions. For inpatient MRI scans, many reports described miscommunication between the referring department (e.g., medical/surgical) and the radiology department about an implant in the patient. For perspective, the following are examples of the narratives of MR screening-related reports submitted to the Authority:

An MRI scan of the patient's right knee was ordered; the patient had a pacemaker.
Patient was ordered an MRI of the brain. The patient was put on the schedule for 10 a.m. The nurse on the floor called down and said he had a pacemaker. The nurse filled out the screening form incorrectly. The physician ordered an MRI on a patient with a pacemaker.

A patient required an MRI of the head. A technician screened the patient and asked if there was anything in [patient's] sweatpants pockets, to which the patient replied "no." When the [MRI] magnet was started, a knife was pulled out of the patient's pocket by the magnet. It stabbed [the patient] in the [arm]. The injury required staples.

A patient developed pain/tingling, during an MRI scan, where a plate and screw were located [implanted]. The patient had been prescreened.

A patient was cleared for metal through family interview per ordering resident. The MRI study was started and a metal artifact was identified. The study was immediately canceled. A CT [computed tomography] scan of the head was done instead of the MRI. [The physician was] notified.

A patient had a tissue expander noted on [screening form] checklist, but MRI was started. Upon review of initial images, a metal artifact was noticed and the scan was stopped.

Patient [was] ordered [an] MRI brain [scan]. The floor [staff] called to verify that patient [was] screened and was told the patient was screened. [The] patient arrived for test, and [staff] found that patient has a pacemaker; a contraindication for the MRI. Patient did not receive MRI.

Patient was having an MRI of the left shoulder. [The patient] was wearing a long-sleeve sweater, and during the course of the scan complained of a warm feeling on the right arm. Patient's arm was repositioned away from scanner and a sponge was placed. After the scan the patient showed the right arm [to a registered nurse (RN)], which had a 2-inch by 1-inch red patch with a slightly blistered area in the center. The CT RN looked at the arm and put ice on it. On inspection of the sweater, it [was noted that] it had a makeup of 18% metallic thread.

Read the entire article at the Pennsylvania Patient Safety Authority

For more information on Metrasens, our Ferromagnetic Detection Technology or how we can assist you in raising the safety level of your facility, please visit our website at http://www.metrasens.com

Sincerely,

Joseph Barwick
Vice-President - North America
Metrasens