Transformation of the MR Safety Culture

Dan Smock BHS RT(R)(MR)(CT), MRSO (MRSC)

MRI Supervisor/MR Safety Officer
Children’s Mercy Hospital-Kansas City, Missouri
Disclosures

• None identified
Objectives

• Evolution of the MR safety culture - 1980’s to present
• Current challenges
• Key strategies to improve the safety culture
Evolution of MR Safety-1980’s…

- Safety policy/procedures
- Informal MRI safety education for the MRI staff
- Restricted access
- Screening-written/oral
- Early published implant lists
- The rest was left to MR Technologists
Evolution of MR Safety 2000-2010

  - Specified MR safety education
  - MRI safety zone designations
  - MRMD/MRSO support
  - Event reporting and QI analysis
- 2005 ASTM labeling changes
- Development/use of MR conditional and nonmagnetic equipment
- Online access to MR safety information

Michael Columbini

Photo courtesy: Tobias Gilk

Children's Mercy
KANSAS CITY
Evolution of MR Safety 2010-Now

- Continued evolution of ACR Guidance Documents (2011, 2013)
- Ferromagnetic screening
- TJC MR safety requirements
- Nonmagnetic dress codes
- ABMRS credentialing
- App for MR safety
- Scanner implant safety management software

The Joint Commission has approved the following revisions for prepublication. While revised requirements are published in the semiannual updates to the print manuals (as well as in the online E-dice®), accredited organizations and paid subscribers can also view them in the monthly periodical The Joint Commission Perspectives®. To begin your subscription, call 877-223-6805 or visit http://www.jointcommission.org.

Prepublication Requirements

Revised Requirements for Diagnostic Imaging Services

Effective July 1, 2016

Standard EC.02.01.01
The (critical access) hospital manages safety and security risks.

Elements of Performance for EC.02.01.01

& H. The (critical access) hospital manages magnetic resonance imaging (MRI) safety risks associated with the scanner room and the area that immediately precedes the entrance to the MRI scanner room.

- Making sure that these restricted areas are controlled by and under the direct supervision of staff trained in MRI safety.
- Placing signage at the entrance to the MRI scanner room that conveys that potentially dangerous magnetic fields are present in the room. Signage should also indicate that the magnet is always on except in cases where the MRI system, by its design, can have its magnetic field routinely turned on and off by the operator.

TJC (2015)
MR’s History of Poor Safety Culture

Contributing factors:

- Increased MRI volumes
- Increasing number of magnets
- Increasing magnetic field strengths
- Few required safety practices
- Lax application of existing safety practices
- Limited reporting and analysis of safety events
- Staff reductions

<table>
<thead>
<tr>
<th>Year</th>
<th>Reports</th>
<th>Accident % change from 2000</th>
<th>Procedure numbers</th>
<th>Utilization % change from 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>31</td>
<td>0%</td>
<td>15.8</td>
<td>--</td>
</tr>
<tr>
<td>2001</td>
<td>40</td>
<td>20%</td>
<td>14</td>
<td>14%</td>
</tr>
<tr>
<td>2002</td>
<td>55</td>
<td>77%</td>
<td>21.9</td>
<td>39%</td>
</tr>
<tr>
<td>2003</td>
<td>46</td>
<td>48%</td>
<td>24.2</td>
<td>53%</td>
</tr>
<tr>
<td>2004</td>
<td>40</td>
<td>29%</td>
<td>24.7</td>
<td>56%</td>
</tr>
<tr>
<td>2005</td>
<td>80</td>
<td>158%</td>
<td>25.3</td>
<td>60%</td>
</tr>
<tr>
<td>2006</td>
<td>83</td>
<td>168%</td>
<td>26.6</td>
<td>68%</td>
</tr>
<tr>
<td>2007</td>
<td>116</td>
<td>274%</td>
<td>27.5</td>
<td>74%</td>
</tr>
<tr>
<td>2008</td>
<td>167</td>
<td>439%</td>
<td>28.4</td>
<td>80%</td>
</tr>
<tr>
<td>2009</td>
<td>194</td>
<td>526%</td>
<td>28.3</td>
<td>85%</td>
</tr>
<tr>
<td>2010</td>
<td>169</td>
<td>445%</td>
<td>30.2</td>
<td>91%</td>
</tr>
<tr>
<td>2011</td>
<td>186</td>
<td>500%</td>
<td>32</td>
<td>103%</td>
</tr>
<tr>
<td>2012</td>
<td>169</td>
<td>445%</td>
<td>32.9</td>
<td>106%</td>
</tr>
<tr>
<td>2013</td>
<td>182</td>
<td>497%</td>
<td>33.8</td>
<td>114%</td>
</tr>
</tbody>
</table>

*MAUDE data retrieved October 11, 2011
**MAUDE data retrieved October 8, 2014
*IMV Medical Information Division. Numbers in millions

Courtesy: Tobias Gilk
• Technically challenging electronic and magnetically active implants
• Ever stronger magnetic fields, more powerful gradients, and new RF safety considerations
• Evolution of MR/OR models
• Increasing emergent MR procedures which challenge safety practices
Additional Pediatric MR Safety Challenges

- Increased volume of anesthetized/sedated patients-requiring additional equipment/staff
- Larger volume of non-MRI personnel
Creating a High Reliability Organization

- Baseline/ongoing safety risk assessments
- Event tracking/analysis
- Heighten screening through advanced methods
- Nonmagnetic dress code
- Continuous development/QI analysis of strategies to eliminate/mitigate risks
- Establish/empower a culture of MR safety
Key Strategies to Improve MR Safety

- Create/sustain/protect a nonmagnetic environment
- Broaden required safety education
- Standardize safety accountability
- Multidisciplinary buy in with administrative championing

Transform the MR Safety Culture
Protect the Castle

- Mandate nonmagnetic dress
- Utilize multi-layered ferromagnetic detection
- Enforce restricted access
- Label loose items, contain essential magnetic items
- Tether large conditional items
- Prepare for emergencies through mock codes/quenches
- Enforce safety protocol-MRMD, MRSO, MR Technologists, and MR Safety Aides
Nonmagnetic Dress Code

- **Mandated** nonmagnetic dress code
- Operating room culture/model
- No exceptions
- Heightens FMD efficacy
- Offer nonmagnetic clothing options
- Nonmagnetic dress helps create/maintain/sustain the culture of safety awareness
Heighten Screening Standards

- Strengthen pre-scheduling screening efforts through technologist review
- Utilize multi-layered ferromagnetic detection
- Perform dedicated MR safety procedural timeouts
- Develop/utilize implant specific screening forms to ensure/document MR conditionality of high risk implants
- MRMD/MRSO review/monitoring of any screening/safety concern
- Ongoing QI/job confirmation of critical processes
Increase MR Safety Education Efforts

- Require level 2 MR safety education for everyone working in the MRI suite
- Tailor education to specific needs
- Perform ongoing assessment of who needs education
- Enforce education requirements through MR access restriction
- Provide accessible safety education formats
- Keep education current to reflect accreditation requirements/changes
- Support advanced MR safety education/ABMRS credentialing-MRMD, MRSO
Increase MR Safety Awareness

- Add additional eyes on safety-MR Safety Aide model
- Require redundant screening layers including layered ferromagnetic detection and procedural timeouts
- Utilize nonmagnetic patient care items
- Nonmagnetic dress
- Level 2 accountability-everyone’s responsibility is safety

Children’s Mercy
KANSAS CITY
Management of Implants

• Specific screening form for highly conditional implants
• Readily accessible implant information in chart
• MRMD, MRSO implant support
• Dr. Kanal’s MR Safety Implant Risk Assessment App
• Use of vendor specific implant safety software
• Utilize available resources (Shellock, MagResource, web based manufacturer information)
Use of Nonmagnetic Equipment

• Use nonmagnetic/zero-magnetic patient care items when possible
• Encourage vendors to develop more pediatric solutions

Personal correspondence, Diana Bean/MRIequip.com (2017)
Elements of a Nonmagnetic MR Safety Culture

- Multidisciplinary approach with safety education and accountability for all
- High visibility of safety efforts
- Fortified MR area with restricted access tied to education
- Use of all screening techniques available including FMD, nonmagnetic dress, procedural timeouts
- QI initiatives to track challenges/continuous improvement
Questions?