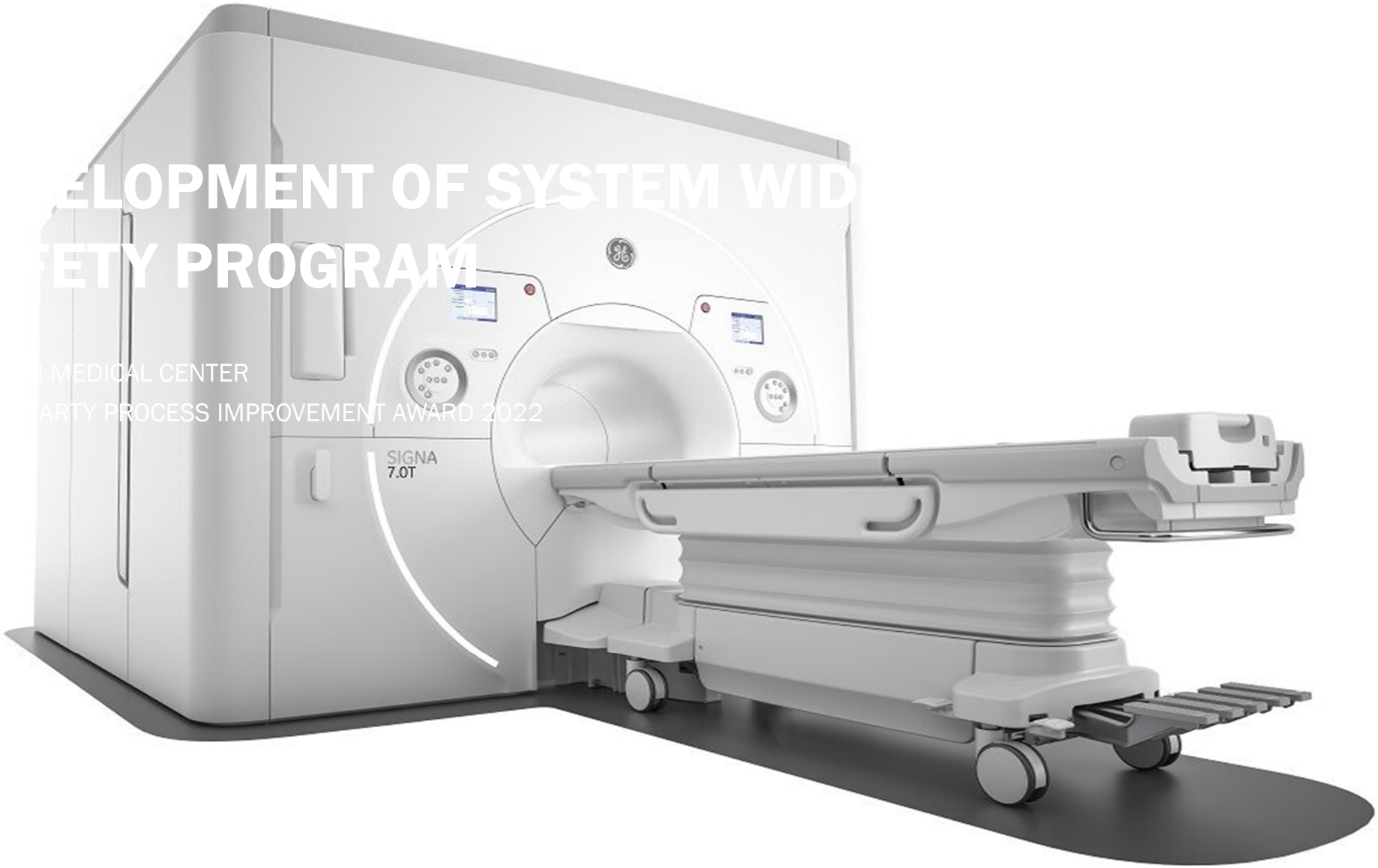
ELOPMENT OF SYSTEM WID
FETY PROGRAM

I MEDICAL CENTER

ARTY PROCESS IMPROVEMENT AWARD 2022



TOPIC

- Development of a system-wide MRI Safety Program to ensure consistency in the implementation of sound MRI safety practices across multiple practice locations

DISCUSSION

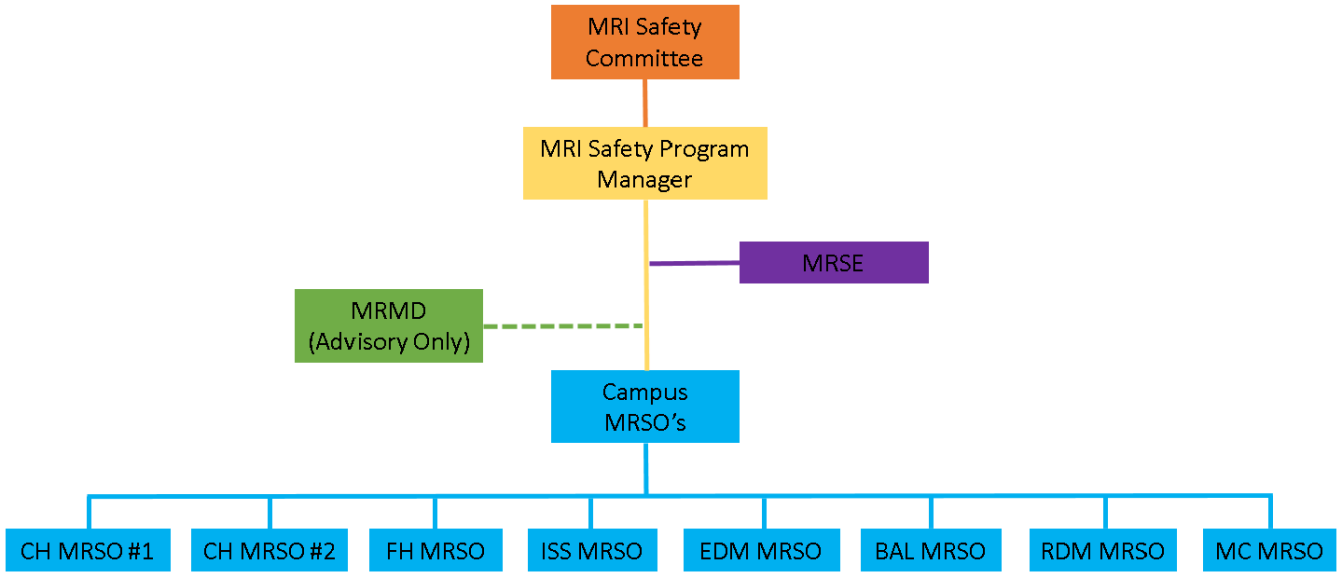
- Swedish had a long-standing “MRI Safety Task Force” that was tasked with resolving all MRI related issues, which included non-safety related issues. This challenged the MRI Safety Task Force with addressing and responding to MRI Safety issues and the effectiveness of the MRI Safety Task Force began to fade. The result was a look at the gaps our MRI Safety Task Force faced and determine how to close those gaps.
- Gaps Identified in our MRI Safety Program
  - In 2013, the American College of Radiology (ACR) released their White Paper detailing the contents of an MRI Safety Program. This called for MRI Safety Policies to be drafted for no less than 19 distinct areas. As of 2020, only 2 policies had been developed and approved through the MRI Safety Task Force. There were local (campus) practices and policies that may or may not be consistent with best practices.
  - Adverse MRI Events were handled at the local (campus) level. There was no reporting or investigation from an unbiased centrally operated department with MRI related expertise.
  - There was no central charge for oversight, implementation, or development of the MRI Safety Program or associated policies, practices, and procedures.
  - There was a lack of higher-level training on MRI Safety topics for MRI Technologists.
  - There were no formal audits or reviews of the MRI Safety Program.

ACTION PLAN & IMPLEMENTATION

- The Action Plan for developing a more robust and effective MRI Safety Program was broken into steps.

Step 1	Step 2	Step 3	Step 4	Step 5
Develop an MRI Safety Program Structure	Develop an Audit Plan	Establish Event Investigation Procedures	Develop Comprehensive and Consistent MRI Safety Policies	Develop & Implement Level II MRI Safety Training for MRI Technologists

IMPLEMENTATION STEP 1

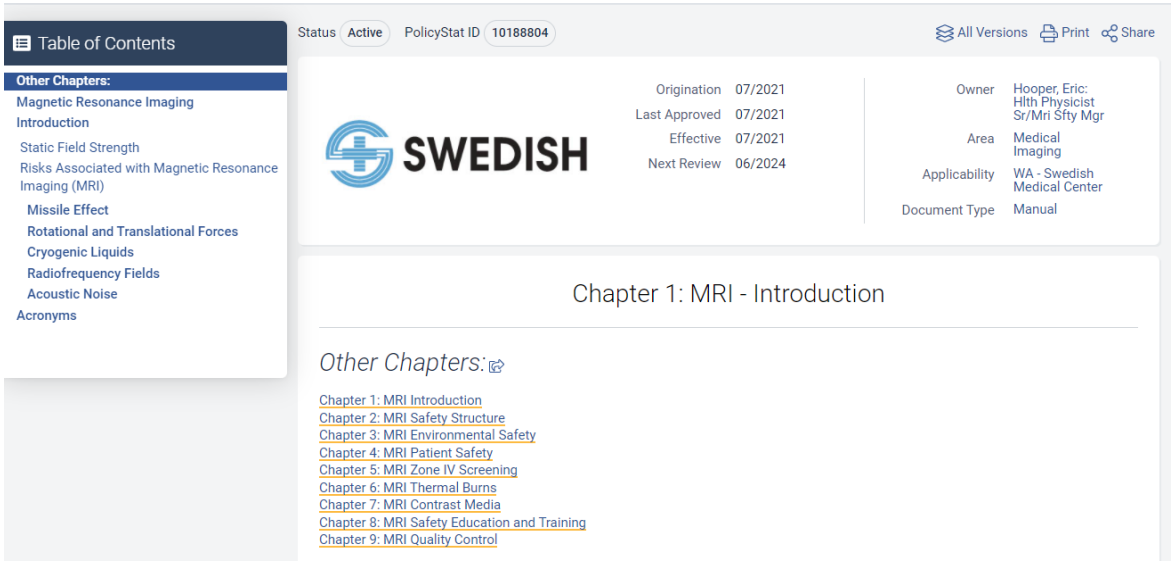


- An MRI Safety Program structure was established at the end of 2020. This structure split the MRI Safety Task Force into two separate groups – the **MRI Task Force** and the **MRI Safety Committee.** The MRI Safety Committee meets on a **quarterly** basis.
- The MRI Safety structure established the MRI Safety Committee as the single committee responsible for MRI Safety issues. It also establishes a single individual to be tasked with MRI Safety issues across the system.
- The structure was borrowed from an existing structure established by the Radiation Safety Program. Other elements, duties, and tasks were taken from ACR guidance documents.

IMPLEMENTATION STEPS 2 & 3

- An Audit Plan of the MRI Safety Program was developed to identify gaps in program activities, opportunities for improvement, review of program function, review of adverse events, and follow up actions.
  - The MRI Safety Program is audited on an **Annual** basis by the MRI Safety Program Manager, MRI Safety Expert, MRI Medical Director, and Facility Administration. A report is presented to the MRI Safety Committee.
- Adverse Events relating to MRI have always been reported through our electronic event reporting process. However, those events were not previously reported or investigated by the MRI Safety Task Force. MRI Safety event reporting now includes the MRI Safety Program Manager to determine any necessary follow up.
  - Events are tracked and reported to the MRI Safety Committee. Serious safety events follow the formal pathway for Root Cause Analysis.

IMPLEMENTATION STEP 4

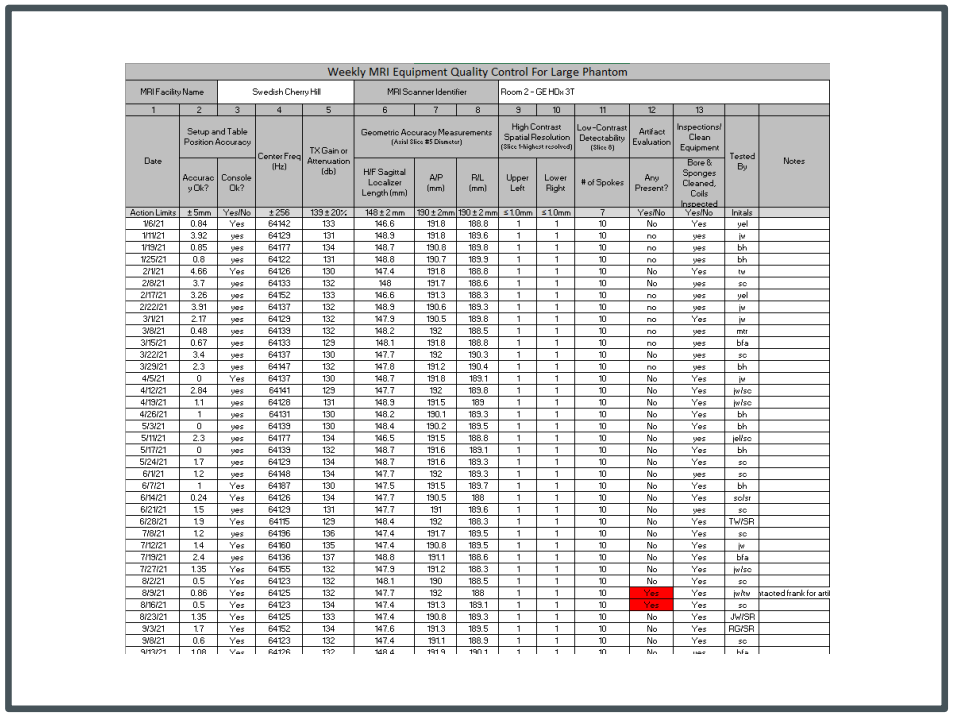


- The development, approval, and implementation of **MRI Safety Policies** has been the most difficult and time-consuming step.
  - Development of 33 individual policies, forms, and practice guides to be implemented across 5 hospitals and 2 ambulatory care centers.
  - Organized into a nearly 100-page long **MRI Safety Manual** instead of many stand-alone policies.
  - The MRI Safety Manual is organized into Chapters and is available on PolicyStat for Caregivers. This allows all sites to have access to the same policies and procedures regardless of equipment, location, technologist, etc.
  - This process took a year and a half of collaborative effort with the MRI Medical Director, Radiologists, MRI Technologists, Physicists, Engineers, Safety, and the MRI Safety Program Manager!

IMPLEMENTATION
STEP 5

- One of the “wins” of the previous MRI Safety Task Force was development of general MRI Safety Awareness for Caregivers. This training qualifies under the ACR Guidelines as Level I Training and is designed for anyone in the hospital who may come into contact with the MRI environment. ALL Swedish Caregivers receive this training.
- However, ACR Guidelines also stipulate that MRI Technologists receive a higher level of training – **Level II Training**
  - Level II Training content was developed in 2021 and is undergoing final touches to be launched on the Swedish LMS
  - Level II Training will be delivered to all MRI Technologists, Service Engineers, Support Staff, and Radiology RN’s

IMPLEMENTATION
BONUS STEP – MRI QUALITY CONTROL



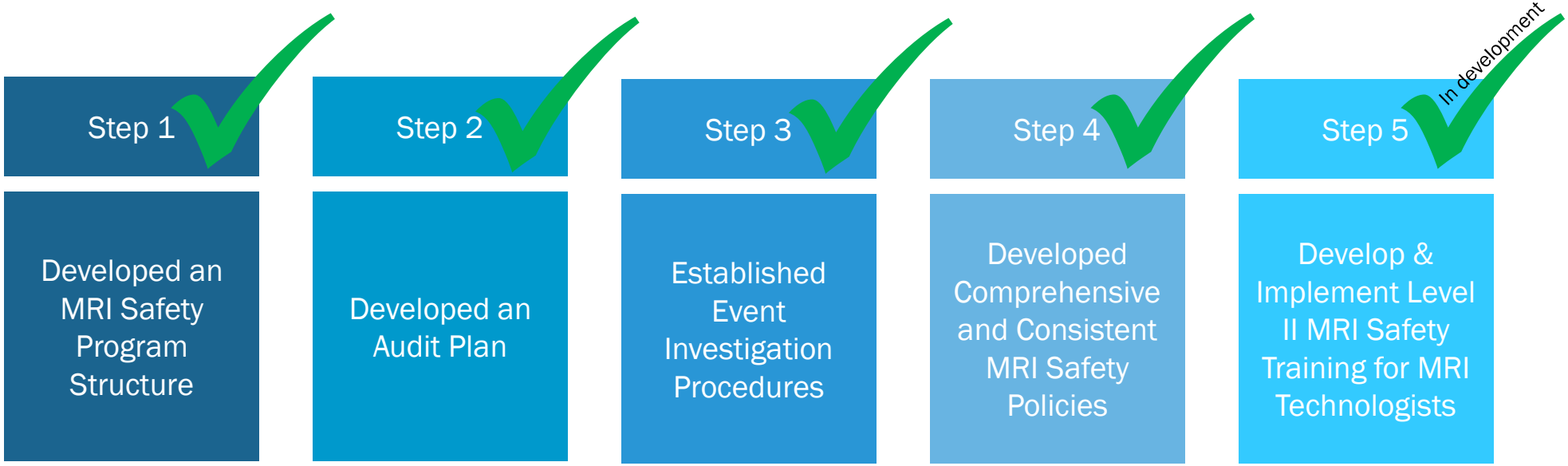
Weekly MRI Equipment Quality Control For Large Phantom

MRI Facility Name		Swedish Cherry Hill			MRI Scanner Identifier			Room 2 - GE HDx 3T							
1	2	3	4	5	6	7	8	9	10	11	12	13			
Date	Setup and Table Position Accuracy		Center Freq (Hz)	TX Gain or Attenuation (db)	Geometric Accuracy Measurements (Axial Slice #5 Diameter)			High Contrast Spatial Resolution (Slice Highest resolved)		Low-Contrast Detectability (Slice #)	Artifact Evaluation	Inspections/ Clean Equipment	Tested By	Notes
	Accuracy Ok?	Console Ok?			H/F Sagittal Localizer Length (mm)	A/P (mm)	R/L (mm)	Upper Left	Lower Right	# of Spokes	Any Present?	Bore & Sponges Cleaned, Coils Inspected		
Action Limits	± 5mm	Yes/No	± 256	139 ± 20%	148 ± 2 mm	190 ± 2mm	190 ± 2 mm	≤ 1.0mm	≤ 1.0mm	7	Yes/No	Yes/No	Initials	
1/6/21	0.84	Yes	64142	133	146.6	191.8	188.8	1	1	10	No	Yes	yel	
1/11/21	3.92	yes	64129	131	148.9	191.8	189.6	1	1	10	no	yes	jw	
1/18/21	0.85	yes	64177	134	148.7	190.8	189.6	1	1	10	no	yes	bh	
1/25/21	0.8	yes	64122	131	148.8	190.7	189.9	1	1	10	no	yes	bh	
2/1/21	4.66	Yes	64126	130	147.4	191.8	188.8	1	1	10	No	Yes	tw	
2/8/21	3.7	yes	64133	132	148	191.7	188.6	1	1	10	No	yes	sc	
2/17/21	3.26	yes	64152	133	146.6	191.3	188.3	1	1	10	no	yes	yel	
2/22/21	3.91	yes	64137	132	148.9	190.6	189.3	1	1	10	no	yes	jw	
3/1/21	2.17	yes	64129	132	147.9	190.5	189.8	1	1	10	no	Yes	jw	
3/8/21	0.48	yes	64139	132	148.2	192	188.5	1	1	10	no	yes	mtr	
3/15/21	0.67	yes	64133	129	148.1	191.8	188.8	1	1	10	no	yes	bfa	
3/22/21	3.4	yes	64137	130	147.7	192	190.3	1	1	10	No	yes	sc	
3/29/21	2.3	yes	64147	132	147.8	191.2	190.4	1	1	10	no	yes	bh	
4/5/21	0	Yes	64137	130	148.7	191.8	189.1	1	1	10	No	Yes	jw	
4/12/21	2.84	yes	64141	129	147.7	192	189.8	1	1	10	No	Yes	jw/sc	
4/19/21	1.1	yes	64128	131	148.9	191.5	189	1	1	10	No	Yes	jw/sc	
4/26/21	1	yes	64131	130	148.2	190.1	189.3	1	1	10	No	Yes	bh	
5/3/21	0	yes	64139	130	148.4	190.2	189.5	1	1	10	No	Yes	bh	
5/11/21	2.3	yes	64177	134	146.5	191.5	188.8	1	1	10	No	yes	jel/sc	
5/17/21	0	yes	64139	132	148.7	191.6	189.1	1	1	10	No	Yes	bh	
5/24/21	1.7	yes	64129	134	148.7	191.6	189.3	1	1	10	No	Yes	sc	
6/1/21	1.2	yes	64148	134	147.7	192	189.3	1	1	10	No	yes	sc	
6/7/21	1	Yes	64187	130	147.5	191.5	189.7	1	1	10	No	Yes	bh	
6/14/21	0.24	Yes	64126	134	147.7	190.5	188	1	1	10	No	Yes	sc/er	
6/21/21	1.5	yes	64129	131	147.7	191	189.6	1	1	10	No	yes	sc	
6/28/21	1.9	Yes	64115	129	148.4	192	188.3	1	1	10	No	Yes	TW/SR	
7/6/21	1.2	yes	64196	136	147.4	191.7	189.5	1	1	10	No	Yes	sc	
7/12/21	1.4	Yes	64160	135	147.4	190.8	189.5	1	1	10	No	Yes	jw	
7/19/21	2.4	yes	64136	137	148.8	191.1	188.6	1	1	10	No	Yes	bfa	
7/27/21	1.35	Yes	64155	132	147.9	191.2	188.3	1	1	10	No	Yes	jw/sc	
8/2/21	0.5	Yes	64123	132	148.1	190	188.5	1	1	10	No	Yes	sc	
8/9/21	0.86	Yes	64125	132	147.7	192	188	1	1	10	Yes	Yes	jw/tw	tracted frank for arti
8/16/21	0.5	Yes	64123	134	147.4	191.3	189.1	1	1	10	Yes	Yes	sc	
8/23/21	1.35	Yes	64125	133	147.4	190.8	189.3	1	1	10	No	Yes	JW/SR	
9/3/21	1.7	Yes	64152	134	147.6	191.3	189.5	1	1	10	No	Yes	RG/SR	
9/8/21	0.6	Yes	64123	132	147.4	191.1	188.9	1	1	10	No	Yes	sc	
9/13/21	1.08	Yes	64126	132	148.4	191.9	190.1	1	1	10	No	yes	bfa	

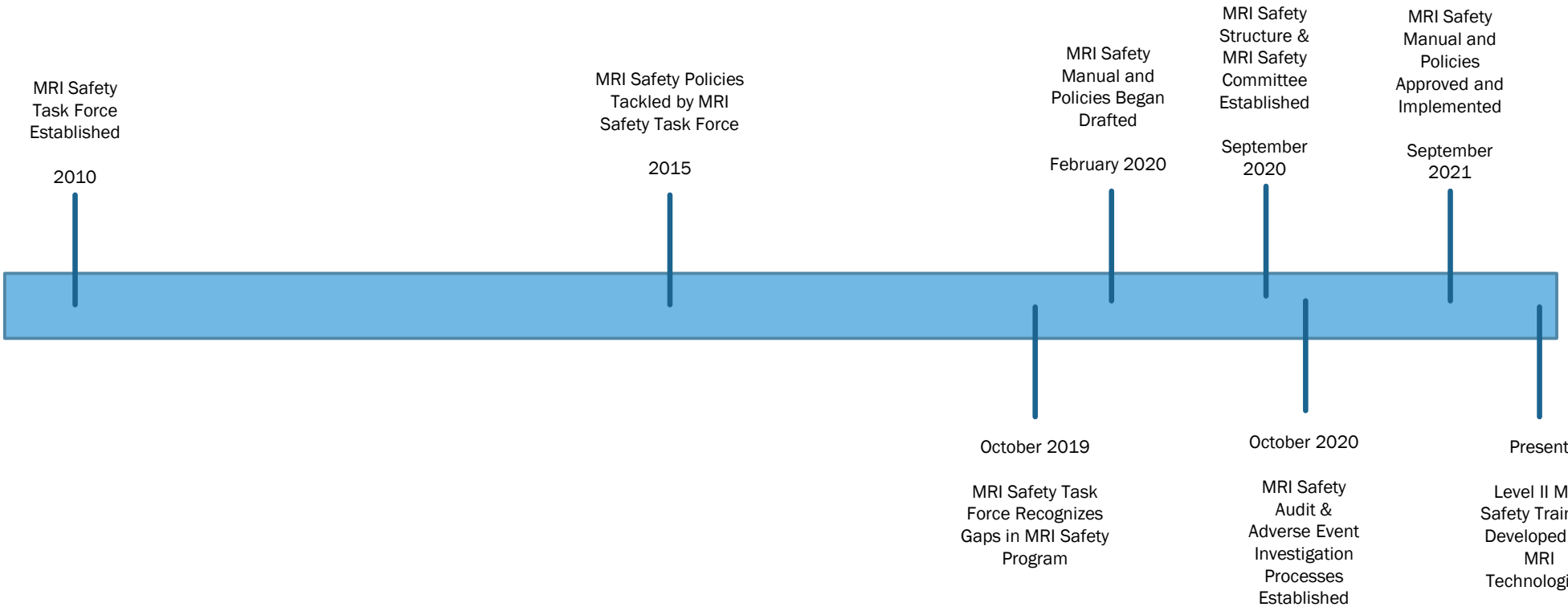
- During review of the MRI Safety Program an additional gap was identified in the performance and tracking of required MRI Quality Control.
  - Swedish Medical Physicists developed training and electronic tracking mechanisms to underscore the importance of routine Quality Control
  - MRI Quality Control documentation is performed weekly for each MRI scanner. MRI QC is documented electronically so that information can be reviewed by the Medical Physicists, Service Engineers, or Management.
  - Each MRI Scanner has pass/fail criteria established by the Medical Physicist, with failing results highlighted in red
- This process has allowed for
  - Better tracking and real-time data reviews without the Medical Physicist or Service Engineer being on-site
  - Review of outlier data
  - Ensuring QC is performed at the required intervals and allowing for intervention if it has not been performed

RESULTS & CONCLUSION

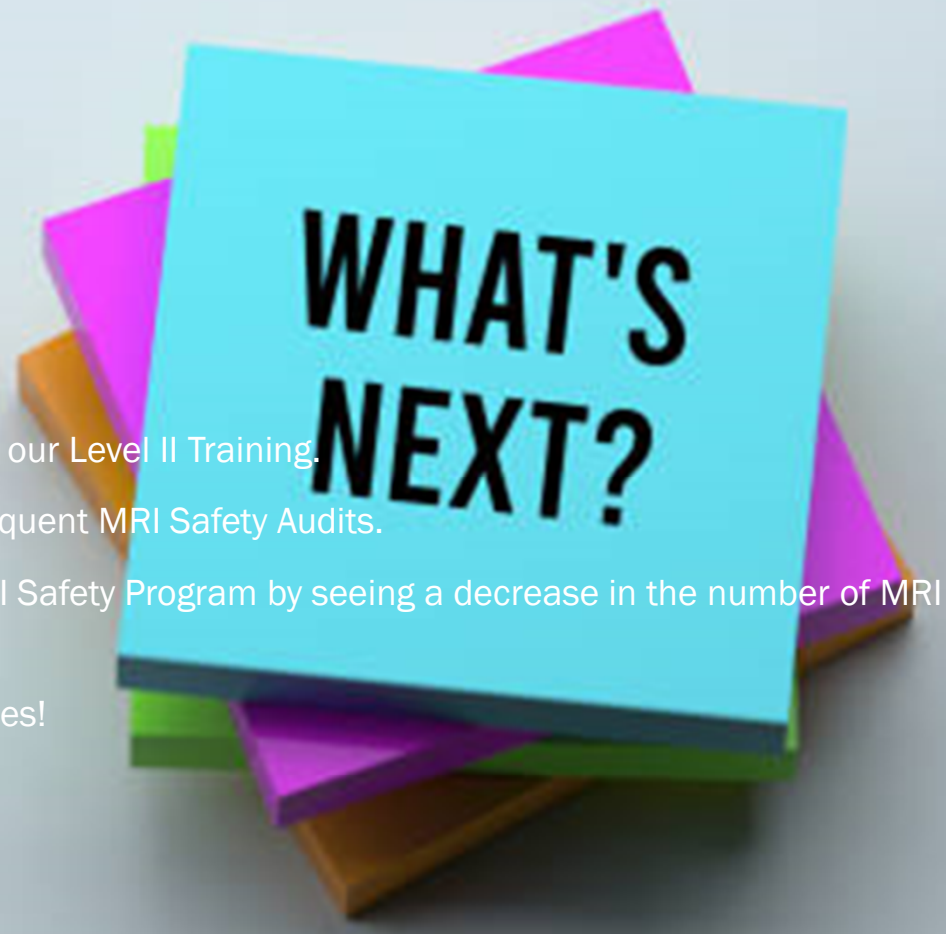
- We have currently satisfied 4.5/5 of the MRI Safety “gaps” identified in 2019.
- Because the gaps we initially identified have been addressed, we know the MRI Safety Structure is working for our organization, brings us in better alignment with ACR Practice Guidelines, and increases the effectiveness of our overall MRI Safety Program.



RESULTS & CONCLUSION TIMELINE



NEXT STEPS



- We will continue with the implementation of our Level II Training.
- Potential development of more robust or frequent MRI Safety Audits.
- We can monitor the effectiveness of the MRI Safety Program by seeing a decrease in the number of MRI adverse events. This is being monitored.
- ...and continuing to address MRI Safety Issues!