

# Improving Quality Assurance and Error Reduction in MRI

Z. Samuel Dahlstedt

## Introduction/Problem

Quality Assurance in MRI was in need of revitalization. The process and associated attitudes became punitive in nature, a far departure from the educational intentions behind the QA process. In order to ensure high-quality diagnostic exams, as well as promote an environment of learning and welcome constructive criticisms without fear of disciplinary action, the QA process needed an overhaul.

Staff morale had dropped due to the heightened scrutiny, and there was a disassociation between MRI staff, MRI management, and radiologists. A collaborative effort between all groups was needed to improve morale, the quality of exams, and overall reduce errors unilaterally.

Improving the QA process would positively impact MRI staff in that they would feel more supported, better understand the nature of errors, with a focus on how to avoid them and how to remedy them effectively and efficiently as well as significantly reduce the number of QA's being submitted through a reduction of errors committed.

## Aim/Goal

The overall aim of this project was to reduce the number of errors committed by reducing the number of QA's submitted over the course of the calendar year.

In the first quarter of 2018, 102 QA's were submitted out of 9002 total MRI's, representing 1.13308% of all exams performed.

By Q4 of 2018, a conservative approach was taken where the aim was to reduce QA's submitted to below 1% of the total of all MRI's performed.

## The Team

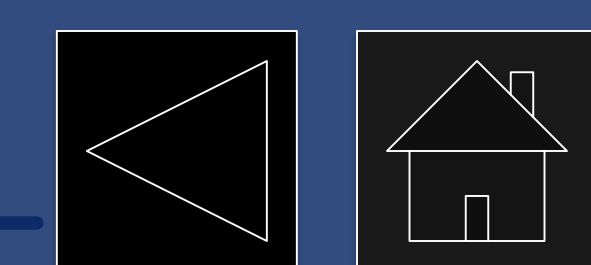
- Z. Samuel Dahlstedt, BAsC, BA, RT (MR) – MRI Clinical Supervisor
- Koenraad Morteale, MD – MRI Director
- Ines Cabral – Goncalves, RT (MR) – MRI Technical Director
- Jason Mangosing, RT (MR) – MRI Clinical Instructor
- Emelia Johnson, BS, RT (R) (MR) - MRI Technologist III

## The Interventions

- In previous years, all QA's were categorized together, regardless of severity, interventions, harm, or limitations. In addition to being categorized by section (Neuro, Body, MSK, Breast), the first change implemented was to subcategorize QA's into one of four groups: Technical, Quality, Protocol, and Incident;
  - **Technical QA's** were defined as "Related to coverage, positioning, reformats, not being transferred to PACS, or not being verified."
  - **Quality QA's** were defined as "Related to blurred images, incomplete exams, or non-repeated sequences."
  - **Protocol QA's** were defined as "Related to scanner issues or being protocolled incorrectly."
  - **Incident QA's** were defined as "Related to wrong exam performed, contrast given inadvertently or against protocol, or scanned under the wrong Medical Record."
- Root Cause Analyses (RCA) were performed on all submitted QA's to determine cause, effect, severity, and if there were potential preventable techniques or actions that were not utilized.
- Trends were looked for among Technologists, Equipment, Protocols, Radiologists, and Orders and were documented and evaluated.
- Meetings were held with Radiology sections and MRI Operations to standardize protocols and better understand nature of QA's and trends were evaluated.
- Protocols were standardized across scanners, updated, and made readily available online.
- Upon recognition of trends in QA's submitted, positively encouraging e-mail reminders would be sent to all staff with information on how the QA's occurred and how to avoid or remedy them when they present.
- If a Technologist was QA'd for the same issue more than once, they were directly communicated with and coaching would be held in a one-on-one education session with an MRI Technologist III or MRI Clinical Instructor.
- Technologists were provided with "Self-Assessments," indicating where they felt comfortable in scanning, and what exams they may need assistance with. To be exposed to more exams and become proficient, Technologists were rotated across sites, and provided educational opportunities within the department.

*For more information, contact:*

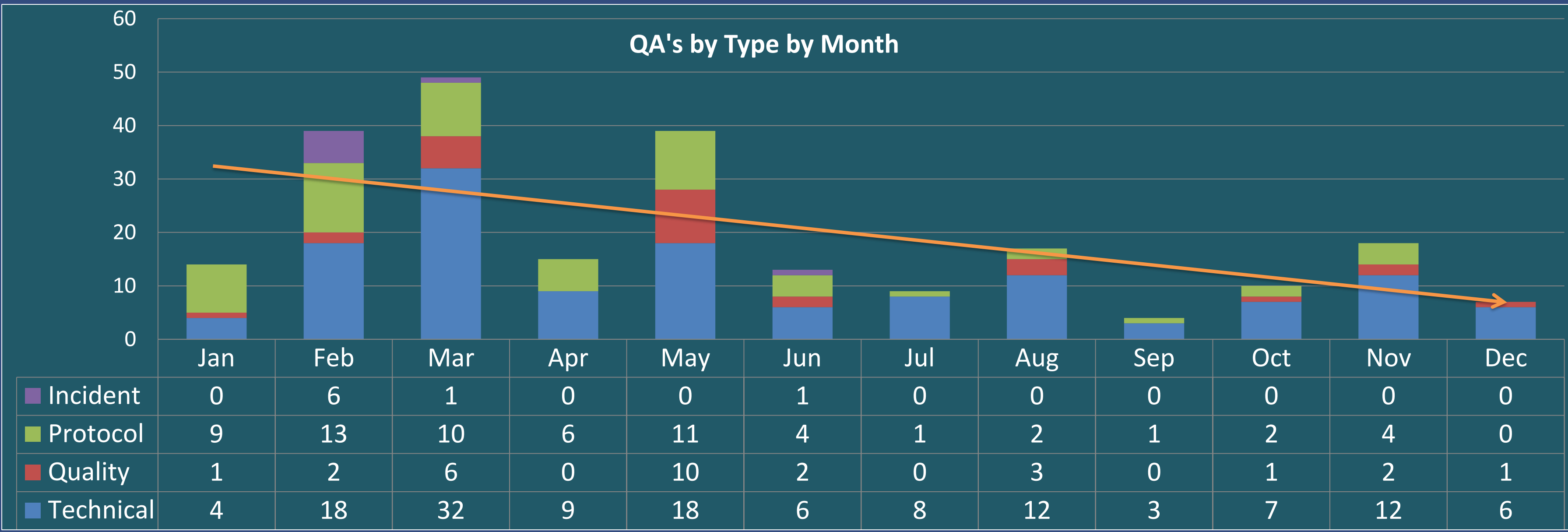
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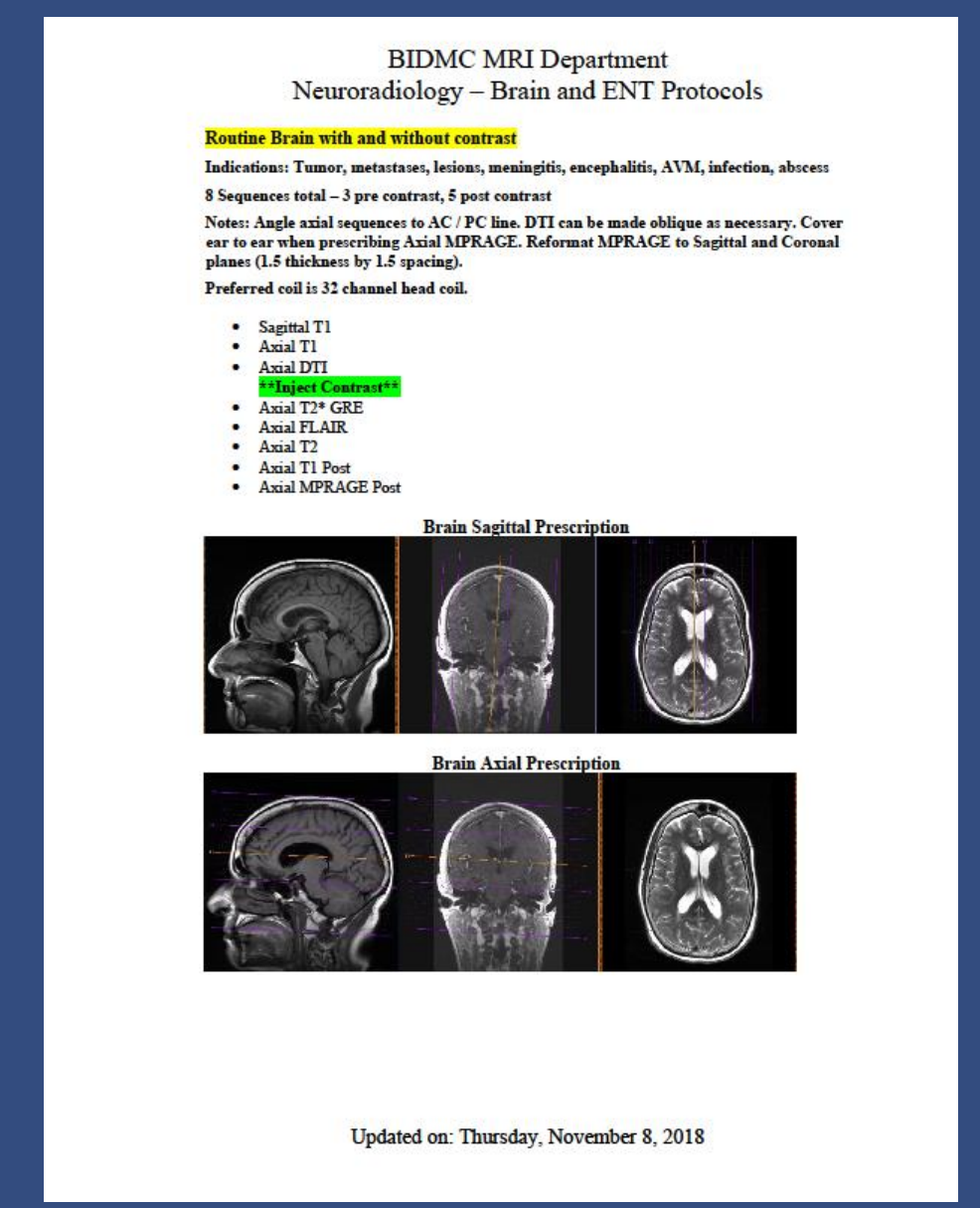
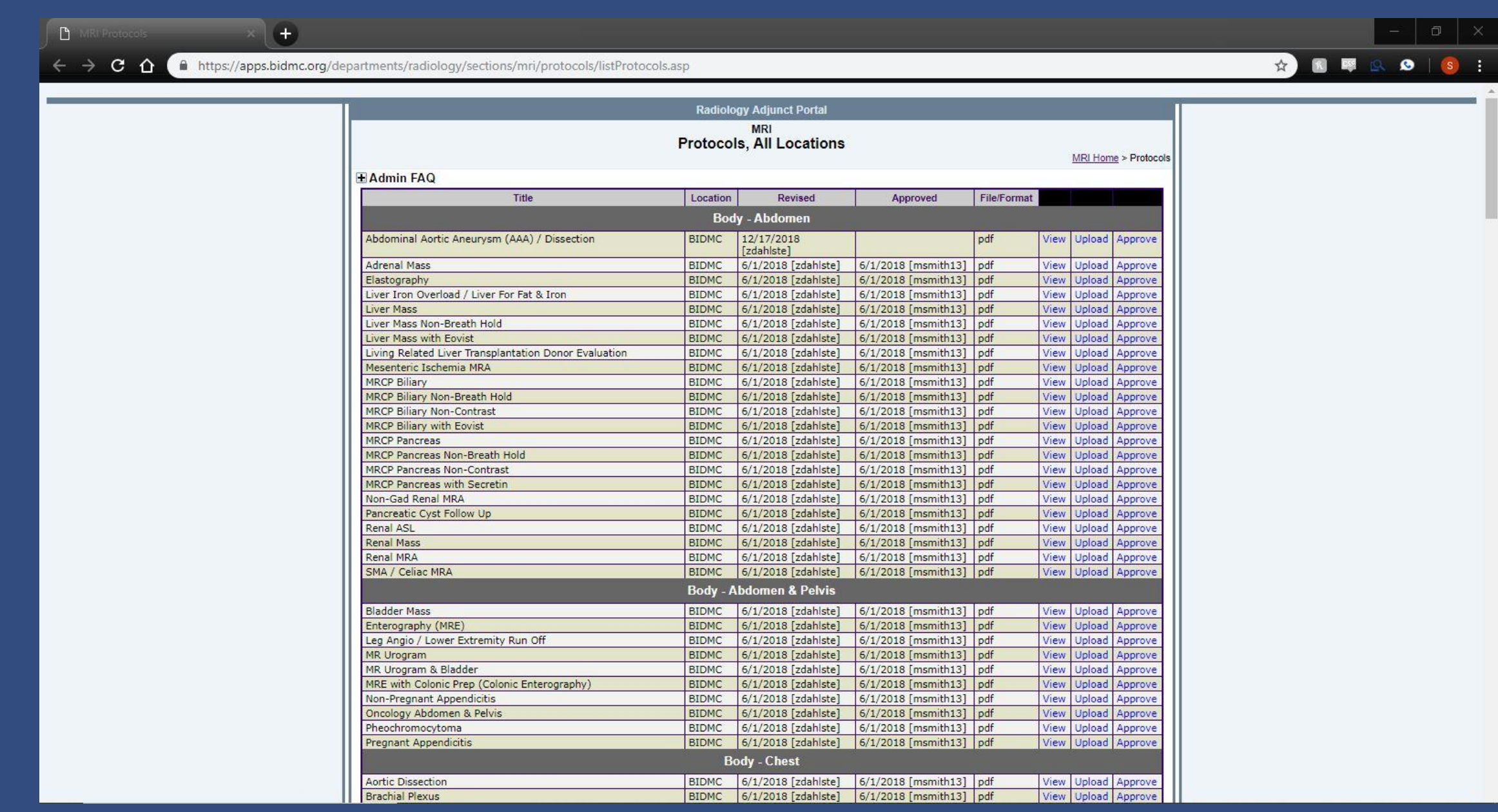
## Results/Progress to Date



In 2018, QA's were categorized into one of four groups. The majority of QA's were categorized as Technical QA's. The total number of QA's submitted declined over the course of the year.

Range	MRI Sum	QA Sum	Neuro Sum	Neuro QA's	MSK Sum	MSK QA's	Breast Sum	Breast QA's	Body Sum	Body QA's	Tech	Qual	Proto	Inc	% QA of Sum	% Change
Jan	2878	14	1687	10	259	0	104	1	828	3	4	1	9	0	0.48645%	0.00000%
Feb	2900	39	1642	28	316	2	138	0	804	9	18	2	13	6	1.34483%	0.85838%
Mar	3224	49	1833	41	334	1	163	0	894	7	32	6	10	1	1.51985%	0.17502%
Q1 Sum	9002	102	5162	79	909	3	405	1	2526	19	54	9	32	7	1.13308%	0.00000%
Apr	3107	15	1743	15	315	0	137	0	912	0	9	0	6	0	0.48278%	-1.03707%
May	3030	39	1699	30	316	2	155	1	860	6	18	10	11	0	1.28713%	0.80435%
Jun	3228	13	1807	8	367	1	178	0	876	4	6	2	4	1	0.40273%	-0.88440%
Q2 Sum	9365	67	5249	53	998	3	470	1	2648	10	33	12	21	1	0.71543%	-0.41765%
Jul	2980	9	1722	3	300	4	139	0	819	2	8	0	1	0	0.30201%	-0.10071%
Aug	2661	17	1254	1	322	1	163	1	922	14	12	3	2	0	0.63886%	0.33684%
Sep	2983	4	1724	0	316	3	140	0	803	1	3	0	1	0	0.13409%	-0.50476%
Q3 Sum	8624	30	4700	4	938	8	442	1	2544	17	23	3	4	0	0.34787%	-0.36756%
Oct	3247	10	1924	2	331	2	161	0	831	6	7	1	2	0	0.30798%	0.17388%
Nov	3179	18	1770	6	321	0	164	0	924	12	12	2	4	0	0.56622%	0.25824%
Dec	3119	7	1787	2	299	2	147	0	886	3	6	1	0	0	0.22443%	-0.34178%
Q4 Sum	9545	35	5481	10	951	4	472	0	2641	21	25	4	6	0	0.36668%	0.01882%
Sum	36536	234	20592	146	3796	18	1789	3	10359	67	135	28	63	8	0.64046%	-0.76640%

From Quarter 1 to Quarter 4 of 2018, the MRI department saw a 0.76640% decrease in QA's.



(Above Left) A screenshot of the new online MRI Protocol Database  
(Above Right) An example of the updated protocol documents

## Lessons Learned

- The initial goal of this project was to reduce total QA's to less than 1% of the total number of MRI's performed. The result was a far greater decline than originally anticipated, bringing QA's to 0.36668% of all exams by the end of the fourth quarter of 2018. The heightened education of MRI Staff and Radiologists, self-competency evaluations, and trend evaluations appeared to be the most effective methods in the promotion of error reduction.

## Next Steps

- The MRI Department will continue to perform in-depth analyses of all QA's submitted to determine cause and prevention of errors.
- Trend evaluations will continue to be a priority.
- Educational opportunities will continue to be provided to all MRI Staff, as well as encouraging collaboration and open communication with Radiologists.
- Continue downward trend of all MRI errors

For more information, contact:

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