Process Improvement: High Quality Breast MRI

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*No Financial Disclosures
High Quality Breast MRI

- Breast MRI is highly sensitive for the detection of breast cancer. In our practice, it is most commonly utilized for breast cancer screening in high risk patients and known breast cancer evaluation.
- We observed a decline in breast MRI image quality.
- Using the PDSA (Plan-Do-Study-Act) cycle model, a process quality improvement (PQI) project was created to determine the causes of this decline and establish interventions that could improve breast MRI quality.
PDSA: Plan – Collecting Data

• A database was created to record 6 key quality parameters and an overall study score:
  1) Patient Positioning
  2) Fat Saturation
  3) Motion
  4) Noise/Artifacts
  5) Background Parenchymal Enhancement (BPE)
  6) Sagittal Sequence quality
  7) Overall

• All parameters were scored by the interpreting radiologist on a 5 point Likert scale (1-Very Poor, 2-Poor, 3-Average, 4-Good, 5-Very Good)

• Additionally the name of the MRI technologist performing the exam and facility name was included.
PDSA: Plan – Collecting Data

A total of 87 breast MRIs were analyzed from January to April 2014 and 3 key areas of greatest improvement were identified:

1) MRI Technologist Experience
2) Patient positioning
3) Sagittal Sequence Acquisition

Fig 1. Example of the data entry form which was filled out by the Interpreting radiologist for each breast MRI.
PDSA: Do – Interventions

• **MRI Technologist Experience**: Dedicated breast MRI technologists were selected at each facility. Selection was based on years of experience, performance, and interest in breast imaging. Dedicated breast MRI techs were to perform or assist in all breast MRIs.

• **Patient Positioning**: All MRI technologists were given a one hour lecture on positioning by a radiologist and lead technologist. Reference materials provided by a radiologist on the importance of quality assurance and proper patient positioning.

• **Sagittal Sequence Acquisition**: MRI physicist, manufacturer applications specialist, and lead technologist were consulted and tasked to explore ways to improve this acquisition to overall increase the signal to noise ratio and to lessen chemical shift artifact which was commonly seen. A new sequence using isotropic voxels was created during the dynamic contrast enhanced series that could be reconstructed to a sagittal image.
PDSA: Study – Analyzing the Results

- Data was then collected on 46 subsequent breast MRIs from September to November 2014 using the same key quality parameters and Likert scale.

- Overall a marked improvement was noted in the areas of prior weakness resulting in a new high resolution sagittal sequence and a reduction in technical call backs. Our goal was met.
PDSA: Study – Analyzing the Results

- The 6 key parameters were scored pre and post intervention during cycle 1 and cycle 2 and an overall rating was given.

- There was an overall increase in studies rated a 4 or 5 (Good or Very Good) in quality and a decrease in studies rated a 1 or 2 (Poor or Very Poor).
Overall Data Pre and Post Intervention

Fig 2. The graph above depicts the overall improvement in image quality post intervention with more studies given a good or very good rating and fewer studies receiving a poor or very poor rating.
Pre and Post Intervention Examples: Positioning

Fig 3. The image on the left shows improper patient positioning with the inferior breast outside of the coil with resultant poor fat saturation and signal flare. The subsequent image on the right is corrected for positioning.
Pre and Post Intervention Example: Sagittal Sequence

Fig 4. The image on the left shows poor fat saturation and extensive chemical shift artifact. After educating the MRI technologists and use of the new sagittal sequence, the patient’s subsequent breast MRI on the right was of higher diagnostic quality.
PDSA: Act – Project Decision

• Our goal was met after one cycle of interventions.
• With a collaborative effort among radiologists, MRI technologists, MRI physicists, and industry application specialists the quality of breast MRIs performed at our institution was greatly improved.
• A greater awareness of the need for high quality breast MRIs was achieved with this team based approach.
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