PROJECT BACKGROUND AND GOALS

The General Radiology Department for Mayo Clinic Health System (MCHS), a community branch of Mayo Clinic, in Southeast Minnesota (SEMN) is supported by the Mayo Rochester Medical Imaging Technical Services (MITS) for image quality concerns.

SEMN Radiology requested image quality improvement support from the MITS team to help decrease the number of image quality improvement (QI) concerns from the Radiologists.

AIM Statement:
Decrease Quality Improvement requests from Radiologist by 10% for lateral knee radiographs without impacting staff satisfaction of quality improvement efforts.

Initially there was no clear process for MCHS or MITS for troubleshooting or assisting with these requests.

We utilized the DMAIC process for quality improvement.

The Department of Mayo Clinic Radiology has a focus on image quality. Higher quality images allow for more accurate and expedited diagnoses.

A scoring rubric is used to assess image quality of all images on a point-based scale (1-15).

Lateral knees are expected to score greater than 11 points, SEMN MCHS (Austin and Albert Lea) lateral knees are lower than this.
## Mayo Clinic Enterprise Project Management
### Standard Stakeholder’s Analysis

A stakeholders’ analysis was done to review the roles and commitments of everyone on the project.

<table>
<thead>
<tr>
<th>Stakeholders (can be Individuals / Groups / Departments)</th>
<th>ARCIVD Role (Accountable, Responsible, Consulted, Informed, Veto, Devils Advocate)</th>
<th>Key Interests &amp; Issues</th>
<th>Assessment of Impact (High, Moderate, Low)</th>
<th>Current Status (advocate, supporter, neutral, critic, blocker)</th>
<th>Strategies for Obtaining Support/Reducing Obstacles</th>
<th>Key Communication Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>D</td>
<td>Timely care, no repeat visits</td>
<td>H</td>
<td>Supporter</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Radiologists - Dr. Brandts Division Chair, Dr. Littrell Division Chair</td>
<td>A, C, I, V</td>
<td>Improve on image quality, Reduction of repeatable images</td>
<td>H</td>
<td>Supporter</td>
<td>Lean education, background, and communication of the “why” behind the changes</td>
<td>Verbal, Sharing Agenda and Minutes</td>
</tr>
<tr>
<td>MCHS Gen Rad Technologists</td>
<td>A, R, C, I, D</td>
<td>Improve on image quality, reduction of repeatable images, reduction of calls to MITS for tools/support</td>
<td>H</td>
<td>Supporter</td>
<td>Lean education, background, and communication of the “why” behind the changes</td>
<td>Verbal, Sharing of strategies, Pre/Post Surveys</td>
</tr>
<tr>
<td>MITS RF Work Unit</td>
<td>A, C, I, D</td>
<td>Improve on image quality, reduction of repeatable images, reduction of calls to MITS for tools/support</td>
<td>H</td>
<td>Supporter, Advocate</td>
<td>Lean education, background, and communication of the “why” behind the changes</td>
<td>Verbal, Meeting attendance, Data collection and analysis</td>
</tr>
<tr>
<td>Jodi Wyse/Ashley Peterson/Paige Sorenson - SEMN Gen Rad Leadership</td>
<td>A, R, C, I, V, D</td>
<td>Improve on image quality, reduction of repeatable images, reduction of calls to MITS for tools/support</td>
<td>H</td>
<td>Supporter, Advocate</td>
<td>Lean education, background, and communication of the “why” behind the changes</td>
<td>Verbal, Meeting attendance, Data collection and analysis</td>
</tr>
<tr>
<td>VCU Staff</td>
<td>C</td>
<td>Lead/Coach</td>
<td>H</td>
<td>Advocate</td>
<td>Project Submission support</td>
<td>Sharing of DMAIC process</td>
</tr>
<tr>
<td>Jo Dean</td>
<td>C, I, D</td>
<td>Improve on image quality, Reduction of repeatable images</td>
<td>H</td>
<td>Supporter, Advocate</td>
<td>Lean education, background, and communication of the “why” behind the changes</td>
<td>Verbal, Meeting attendance, Data collection and analysis</td>
</tr>
</tbody>
</table>
MEASURE

Collect data about the existing process

IMAGE SCORING RUBRIC

A rubric was used to score each image for quality standards

RUBRIC
Total Possible: 15 = Gold Standard

<table>
<thead>
<tr>
<th>Rank</th>
<th>Key</th>
<th>High Quality</th>
<th>Diagnostic Image Phelps improvement opportunities in 1-2 areas. Average PAR image</th>
<th>Improvement needed in 3 or more areas. Image offers very little diagnostic value. Another attempt should have been made.</th>
<th>Unacceptable /Undiagnostic</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Image Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position of Part</td>
</tr>
<tr>
<td>Centered to Part</td>
</tr>
<tr>
<td>Collimation /Shuttering</td>
</tr>
<tr>
<td>Marking /Labeling</td>
</tr>
<tr>
<td>Exposure Factors</td>
</tr>
</tbody>
</table>

0-4 RED
The Image should not pass to a radiologist

5-9 PINK
Below Standard Imaging Expectations

10-12 LIGHT GREEN
Acceptable image; room for improvement

13-14 DARK GREEN
Acceptable image; Striving for Gold!

15 GOLD
Gold Standard Image

On the average patient, how often do you feel you struggle to get an ideal image on the following views?
- AP Bilateral knees
- Lateral Standing Knees
- Patella
- AP Shoulder
- Grashey Shoulder
- Scott
- Axillary

Do you feel that specific marker placement would be beneficial to the radiologist? (or would increase the quality of the exam?)
- Yes
- No

Do you feel there is an advantage to learning the image critique practice Rochester utilizes?
- Yes
- No

I feel there is a need for more quality improvement projects/education. (agree or disagree)

How satisfied are you with the current quality improvement process?
- Very unsatisfied
- Somewhat unsatisfied
- Neutral
- Somewhat satisfied
- Very satisfied

I would like to receive quality improvement education
- Weekly
- Biweekly
- Monthly
- Quarterly

I am actively committed to continuously learning and developing my skills.
- Completely disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Completely agree

My work gives me a sense of achievement.
- Completely disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Completely agree

I feel job satisfaction in my current role.
- Completely disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Completely agree

PRE AND POST STAFF SURVEY
FOR BALANCING MEASURE

©2024 Mayo Foundation for Medical Education and Research | slide-5
FISHBONE DIAGRAM

Effect: Lateral knee images scoring less than 11 points on rubric scale for SEMN Austin and Albert Lea

ANALYZE
Identify the root issues and resolve

Analyzing what is causing images to score less than 11 points

POSITIONING/CENTERING
- Centering too low/too high
- Front to back centering off
- Not verifying their centering
- Rotation
- Too much knee bend
- Wrong tube angle

COLLIMATION
- Varying collimation sizes
- Manual Collimation to 10x12 not set in background
- Missing mag marker (needed on all knees)
- Missing BBs or stdg marker
- If not marked stdg implies not stdg
- Markers/supplies not always available
- Marker and Mag marker placement

MARKING
- Varying body habitus
- Radiologist expectations vary

EXPOSURE
- Wrong technique used

ARTIFACTS
- Clothing artifact
- White fuzziness-shutter off in Rochester

PEOPLE
- Varying body habitus

©2024 Mayo Foundation for Medical Education and Research | slide-6
5 WHYS
Identify root causes analysis

**STANDARDIZATION OF SUPPLIES AVAILABLE**

**PATIENT POSITIONING EDUCATION**

**PATIENT CENTERING EDUCATION**

**MARKING EDUCATION**

**STANDARDIZATION FOR MARKING IMAGES**

**OVERLOADED SCHEDULE**

**STANDARDIZATION OF AVAILABLE EQUIPMENT**
59
Lateral images were sampled for baseline use

62%
Of the 59 images, 62% scored >11

72%
The target is to increase the number of lateral images scoring >11 by 10%

90%
The actual increase on post intervention measures was 90% of the images scored >11

**IMPROVEMENT MEASURES**

1. **EDUCATION MODULES** were created and administered to techs

2. **MARKER SUPPLY** was reviewed and replenished to ensure standardization

**PERCENTAGE OF LATERAL KNEES SCORING ABOVE 11 POINTS**

![Percentage of lateral knees scoring above 11 points chart]

**Staff survey results:**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Pre</th>
<th>Neutral</th>
<th>Satisfied</th>
<th>Not satisfied</th>
<th>Post</th>
<th>Neutral</th>
<th>Satisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Positioning</td>
<td>3%</td>
<td>10%</td>
<td>87%</td>
<td>9%</td>
<td>16%</td>
<td>73%</td>
<td></td>
</tr>
<tr>
<td>Patient Positioning</td>
<td>13%</td>
<td>50%</td>
<td>37%</td>
<td>14%</td>
<td>68%</td>
<td>18%</td>
<td></td>
</tr>
<tr>
<td>Patient Positioning</td>
<td>10%</td>
<td>37%</td>
<td>53%</td>
<td>14%</td>
<td>64%</td>
<td>23%</td>
<td></td>
</tr>
<tr>
<td>Image Critique</td>
<td>50%</td>
<td>0%</td>
<td>50%</td>
<td>55%</td>
<td>0%</td>
<td>45%</td>
<td></td>
</tr>
<tr>
<td>Image Critique</td>
<td>27%</td>
<td>0%</td>
<td>73%</td>
<td>5%</td>
<td>0%</td>
<td>95%</td>
<td></td>
</tr>
<tr>
<td>Quality Improvement</td>
<td>50%</td>
<td>0%</td>
<td>50%</td>
<td>23%</td>
<td>0%</td>
<td>77%</td>
<td></td>
</tr>
<tr>
<td>Quality Improvement</td>
<td>23%</td>
<td>55%</td>
<td>22%</td>
<td>9%</td>
<td>14%</td>
<td>77%</td>
<td></td>
</tr>
<tr>
<td>Quality Improvement</td>
<td>20%</td>
<td>50%</td>
<td>30%</td>
<td>5%</td>
<td>25%</td>
<td>73%</td>
<td></td>
</tr>
<tr>
<td>Quality Improvement</td>
<td>33%</td>
<td>43%</td>
<td>23%</td>
<td>45%</td>
<td>45%</td>
<td>9%</td>
<td></td>
</tr>
<tr>
<td>Job Satisfaction</td>
<td>7%</td>
<td>20%</td>
<td>80%</td>
<td>5%</td>
<td>27%</td>
<td>68%</td>
<td></td>
</tr>
<tr>
<td>Job Satisfaction</td>
<td>10%</td>
<td>13%</td>
<td>83%</td>
<td>9%</td>
<td>14%</td>
<td>77%</td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>20%</td>
<td>20%</td>
<td>50%</td>
<td>9%</td>
<td>18%</td>
<td>71%</td>
<td></td>
</tr>
</tbody>
</table>
PRE
IMPROVEMENT
PROCESS
Rotation of joint, off centered image

POST
IMPROVEMENT
PROCESS
Overlapping condyle (no rotation), knee joint centered
CONTROL

1. SEMN team members will provide education modules to new staff.
2. SEMN lead technologists will audit lateral knee images.
3. Root Cause Analysis and reaction plan will be reimplemented if needed.

FINANCIAL BENEFITS

An added unintentional benefit is a time/financial savings. There is a difference of 15.9 minutes between the pre intervention and post intervention knee exam times. This saves time and money for the department, freeing the tech almost 16 minutes.

1. Pre-intervention knee exams took 23.2 minutes to complete.
2. Post intervention knee exams took 7.3 minutes to complete.

A drastic time savings due to correct positioning and not needing to repeat images.

PROJECT CONCLUSION

Technologist satisfaction was another unintentional benefit of the improvement process. The technologists were more appreciative of the education than we expected. The education process gave them more value for their images and a goal to strive for at work.

This process can be applied to any image and will be of great value to our practice.