MAYO CLINIC

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LATERAL KNEE RADIOGRAPH

QUALITY IMPROVEMENT PROJECT

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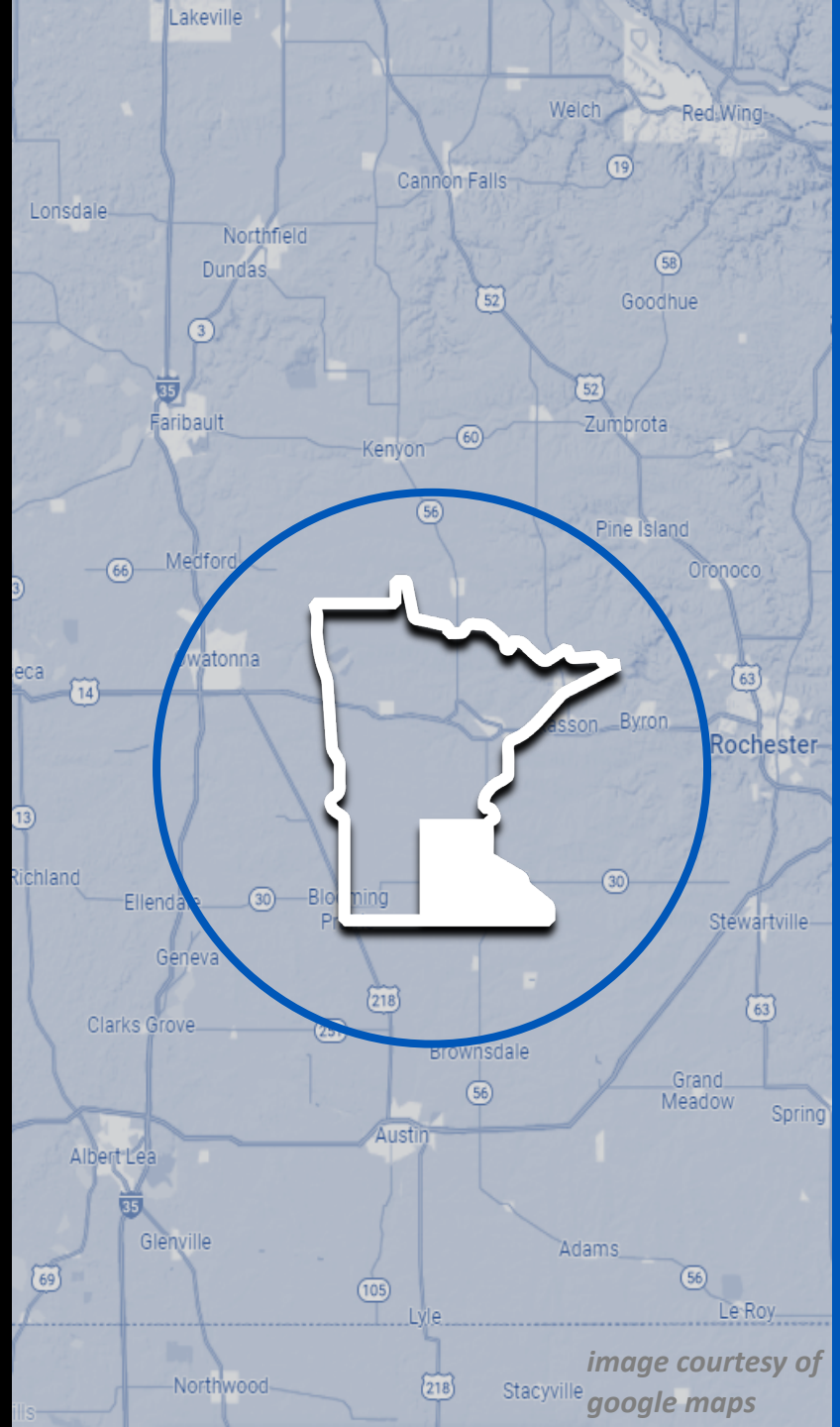
PROJECT BACKGROUND AND GOALS

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.



GOALS:

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.

Ted Hessing, DMAIC Overview, www.sixsigmastudyguide.com/dmaic/

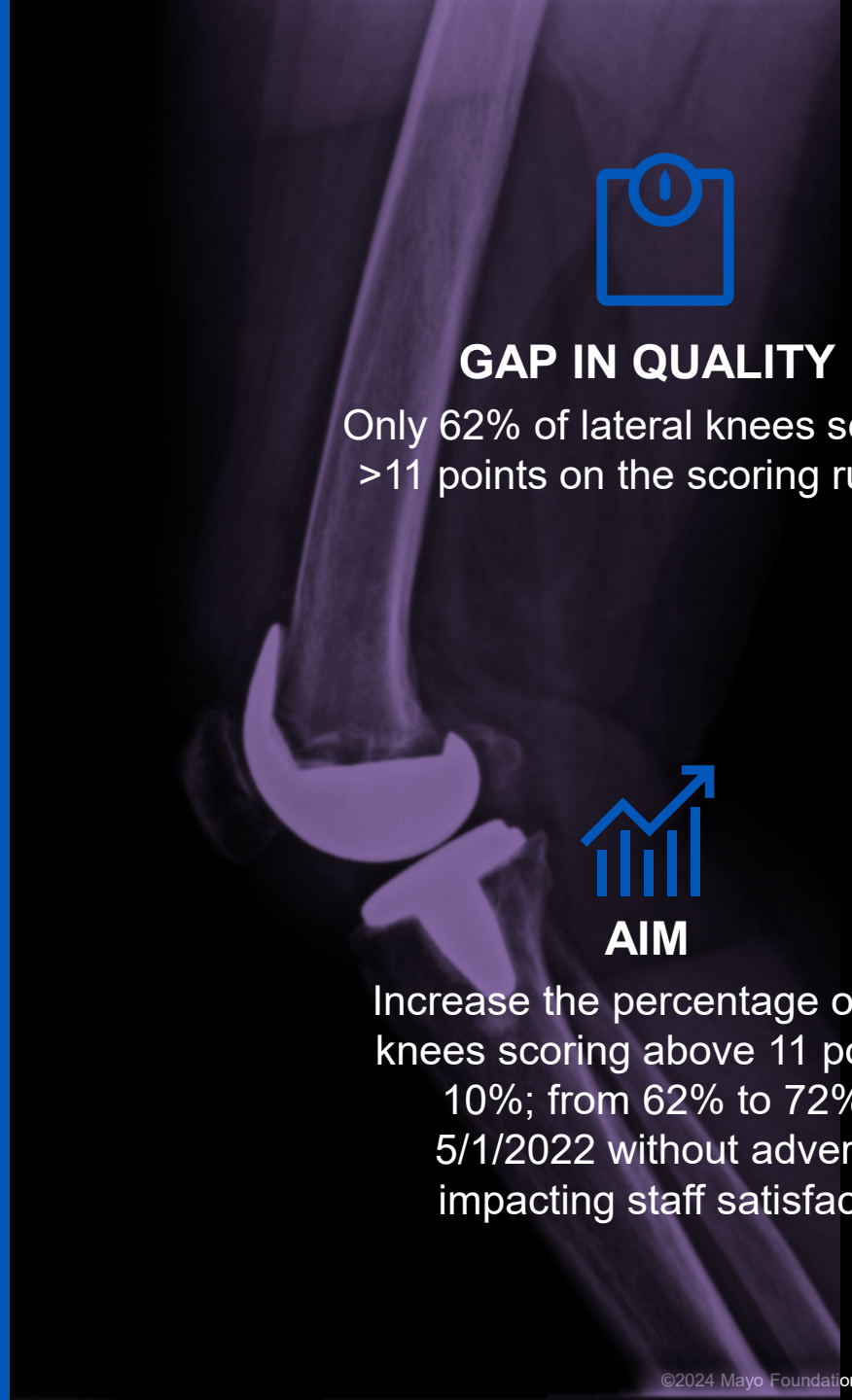
DEFINE

What we know about the process

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.



GAP IN QUALITY

Only 62% of lateral knees scored >11 points on the scoring rubric

AIM

Increase the percentage of lateral knees scoring above 11 points by 10%; from 62% to 72% by 5/1/2022 without adversely impacting staff satisfaction

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

Project:	SEMN MCHS Image Quality Improvement: Albert Lea and Austin					5/23/2022
Stakeholders (can be Individuals / Groups / Departments)	ARCIVD Role (Accountable, Responsible, Consulted, Informed, Veto, Devils Advocate)	Key Interests & Issues	Assessment of Impact (High, Moderate, Low)	Current Status (advocate, supporter, neutral, critic, blocker)	Strategies for Obtaining Support/ Reducing Obstacles	Key Communication Points
Patients	D	Timely care, no repeat visits	H	Supporter	N/A	N/A
Radiologists - Dr. Brandts Division Chair, Dr. Littrell Division Chair	A, C, I, V	Improve on image quality, Reduction of repeatable images	H	Supporter	Lean education, background, and communication of the "why" behind the changes	Verbal, Sharing Agenda and Minutes
MCHS Gen Rad Technologists	A, R, C, I, D	Improve on image quality, reduction of repeatable images, reduction of calls to MITS for tools/support	H	Supporter	Lean education, background, and communication of the "why" behind the changes	Verbal, Sharing of strategies, Pre/Post Surveys
MITS RF Work Unit	A, C, I, D	Improve on image quality, reduction of repeatable images, reduction of calls to MITS for tools/support	H	Supporter, Advocate	Lean education, background, and communication of the "why" behind the changes	Verbal, Meeting attendace, Data collection and analysis
Jodi Wyse/Ashley Peterson/Paige Sorenson - SEMN Gen Rad Leadership	A, R, C, I, V, D	Improve on image quality, reduction of repeatable images, reduction of calls to MITS for tools/support	H	Supporter, Advocate	Lean education, background, and communication of the "why" behind the changes	Verbal, Meeting attendace, Data collection and analysis
VCU Staff	C	Lead/Coach	H	Advocate	Project Submission support	Sharing of DMAIC process
Jo Dean	C, I, D	Improve on image quality, Reduction of repeatable images	H	Supporter, Advocate	Lean education, background, and communication of the "why" behind the changes	Verbal, Meeting attendace, Data collection and analysis

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

Rank	3	2	1	0
Key	**High Quality**	**Acceptable**	**Below Standards**	**Unacceptable /Undiagnostic**
	GOLD STANDARD! Excellent Image Meets all quality criterian at its ideal.	Diagnostic Image Exhibits improvement opportunities in 1-2 areas. Average /PAR Image.	Improvement needed in 3 or more areas. Image offers very little diagnostic value. Another attempt should have been made.	Image is useless; should be repeated. No diagnostic value.
Image Criterion				
Position of Part				
Centered to Part				
Collimation /Shuttering				
Marking /Labeling				
Exposure Factors				

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

PRE AND POST STAFF SURVEY FOR BALANCING MEASURE

On the average patient, how often do you feel you struggle to get an ideal image on the following views?

AP Bilat Standing Knees
Not at all Rarely Sometimes Often Always

Lateral Standing Knees
Not at all Rarely Sometimes O

Patella
Not at all Rarely Sometimes O

AP Shoulder
Not at all Rarely Sometimes O

Grashey Shoulder
Not at all Rarely Sometimes O

Scap Y
Not at all Rarely Sometimes O

Axillary
Not at all Rarely Sometimes Often Always

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
Free Text?

The feedback I receive from the quality improvement process has been directly applicable to my daily work.
Completely Disagree Somewhat disagree Neutral Somewhat agree Completely agree
Free Text?

I receive quality improvement education frequently enough to increase my technical knowledge.
Completely Disagree Somewhat disagree Neutral Somewhat agree Completely agree

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

ANALYZE

Identify the root issues and resolve

FISHBONE DIAGRAM

Analyzing what is causing images to score less than 11 points

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5 WHYS

Identify root causes analysis

Lateral Knees: 5 Whys RCA
Missing Mag Marker
*Techs unaware mag markers needed for all knees
**Importance of mag marker on all knees not conveyed
***Education behind WHY the mag marker is always needed not conveyed
Too Much Knee Bend
*Poor original foot and body position of patient
**Importance of starting the patient in the right position before bending
***Is there standard language for guiding patient positioning?
****Education on HOW to successfully position a standing lateral knee not available.
Rotation
*Difficult to feel landmarks on all patients knees
**Techs unaware of how much rotation is acceptable
***Rolodex does not offer education on when to repeat for rotation
****Education needed to help position difficult anatomy and when to repeat an image
Centering too low/too high
*Cephalic angle requires patients to step on stepstool
**Not all patients can step on step stool
***Room restrictions of not being able to lower tube enough when patients cannot step on step stool
****No standardization of room equipment

Marker Placement
*Markers not always in same location
**SEMN MCHS does not follow rolodex recommendations for marker placement
***Marker placement not standardized for consistency
Poor Technique
*Lightfield does not show up correct for some systems (manual collimation)
**Techniques are created for ideal patient centering
***Patient poorly centered results in poor technique
****Need for education on patient centering with standing lateral knees
Clothing Artifacts
*Patients not always changing
**Try to move clothing out of the way or out of the focal point
***Artifact around edges of x-rays are distracting for rads
****Standardization of supplies for patient changing is needed
Not repeating due to busy schedule
*Volume of scheduled exams is too high for capabilities
**Ortho can double book xray patients
***No scheduling expectations communicated
****No standard scheduling template

Front to back centering
*Xray system not always collimating appropriately
**Technologists unaware of the need to collimate before positioning
***Education on importance of colimating before positioning patient
Missing BB's/Stdg Markers
*BB's are the standard for SEMN MCHS to show stdg vs non-stdg
**Students come from RST and do not have BB's
***Not all sites had STDG markers available for rotating students
****Need standardization of supplies available to all sites
No STDG implies not stdg?
*Different markers used when BBs not on film
**No BBs and no annotations lead to questions if knee was done standing
***No standardization for marking images SEMN MCHS

KEY CAUSES FOR GAP IN QUALITY

- STANDARDIZATION OF SUPPLIES AVAILABLE
- PATIENT POSITIONING EDUCATION
- PATIENT CENTERING EDUCATION
- MARKING EDUCATION
- STANDARDIZATION FOR MARKING IMAGES
- OVERLOADED SCHEDULE
- STANDARDIZATION OF AVAILABLE EQUIPMENT

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Test and implement solutions

IMPROVE

59

Lateral images were sampled for baseline use

62%

Of the 59 images, 62% scored >11

72%

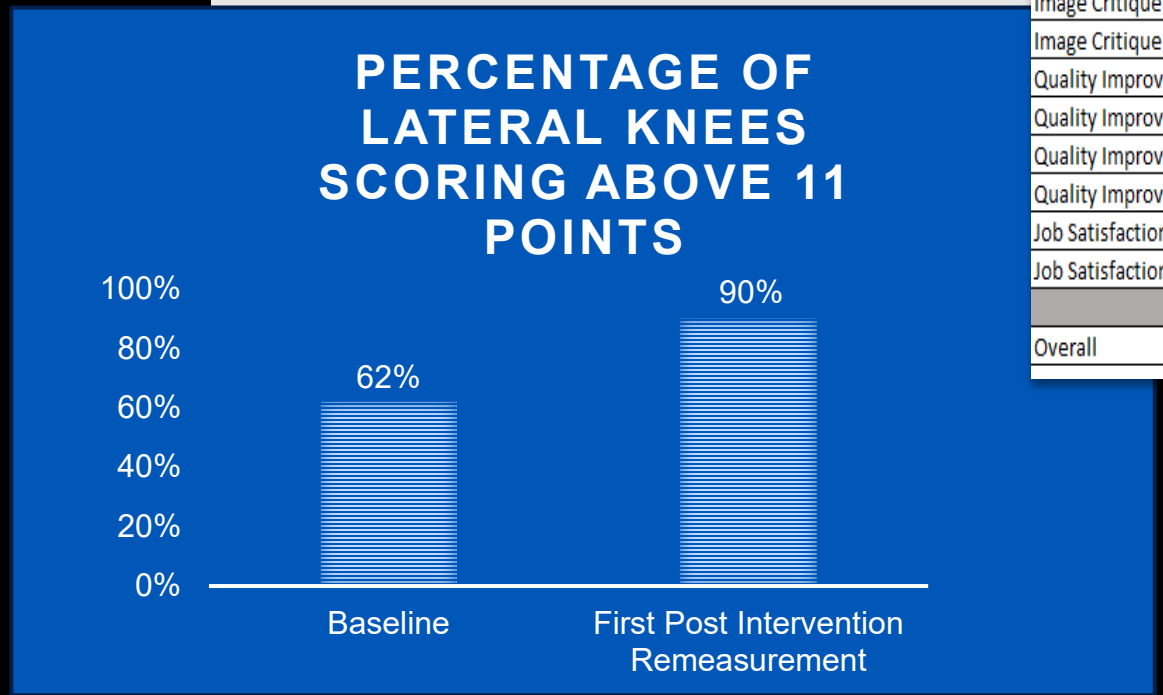
The target is to increase the number of lateral images scoring >11 by 10%

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



Staff survey results:

	Pre				Post		
Topic	Not satisfie	Neutral	Satisfied		Not satisfied	Neutral	Satisfied
Patient Positioning	3%	10%	87%		9%	18%	73%
Patient Positioning	13%	50%	37%		14%	68%	18%
Patient Positioning	10%	37%	53%		14%	64%	23%
Image Critique	50%	0%	50%		55%	0%	45%
Image Critique	27%	0%	73%		5%	0%	95%
Quality Improvement	50%	0%	50%		23%	0%	77%
Quality Improvement	23%	53%	23%		9%	14%	77%
Quality Improvement	20%	30%	50%		5%	23%	73%
Quality Improvement	33%	43%	23%		45%	45%	9%
Job Satisfaction	7%	20%	80%		5%	27%	69%
Job Satisfaction	10%	13%	83%		9%	14%	77%
Overall	20%	20%	50%		9%	18%	73%

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PRE IMPROVEMENT PROCESS

Rotation of joint, off centered image

POST IMPROVEMENT PROCESS

Overlapping condyle (no rotation), knee joint centered

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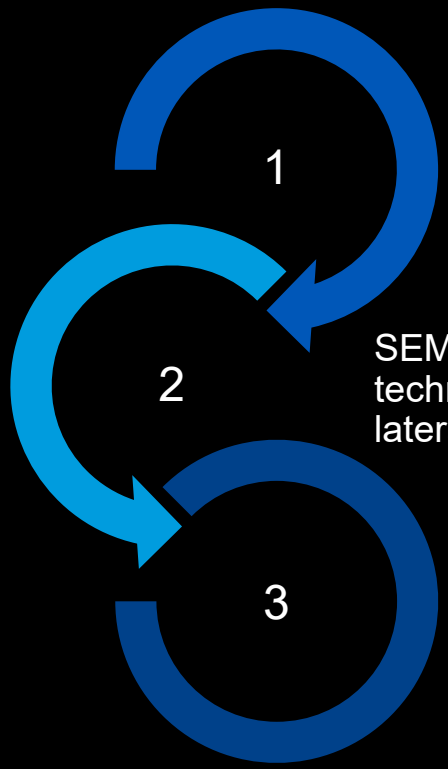
CONTROL

Set standards to sustain the process



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.

23.2

7.3

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.

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