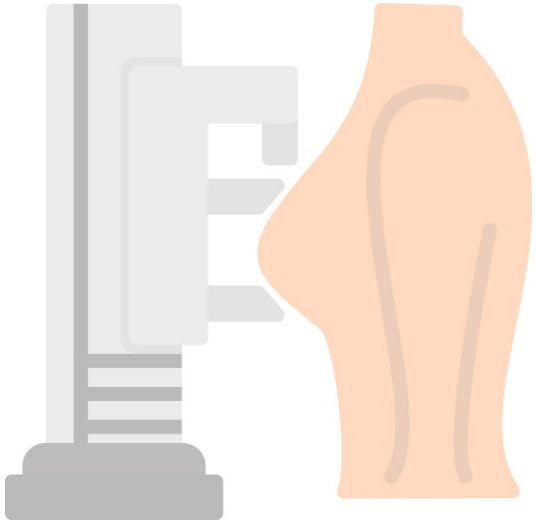
Abstract # R5A-QI-5

Applying Lean Six Sigma Techniques to Patient Flow in the Breast Imaging Service: A Tertiary Center's Experience and Process of Improvement



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Disclosures

- The authors have no disclosures

Introduction

- Timely workup of suspicious findings on screening mammograms is critical for early detection and treatment of breast cancer
- The time required to reach a “final” verdict on whether the lesion is cancer is called time to diagnostic resolution (TTR)
- **Ineffective patient flow for breast cancer screening, as reflected by prolonged TTR, jeopardizes the prognostic value of mammograms**
  - Delays in breast cancer diagnosis impact survival, with 3–6-month delays reducing survival chances[1] and 1-year delays leading to advanced stage at diagnosis[2]
  - Patient anxiety plays a significant role in breast cancer screening, with long TTR increasing anxiety and higher anxiety levels leading to delayed or avoided screenings, perpetuating delays in treatment[3]
  - Delayed TTR can even expose providers to malpractice litigations[4]

1. Richards M et al. Influence of delay on survival in patients with breast cancer: a systematic review. The Lancet 1999.
2. Lameijer JRC et al. Delayed breast cancer diagnosis after repeated recall at biennial screening mammography: an observational follow-up study from the Netherlands. Br J Cancer 2020.
3. Brett J et al. The psychological impact of mammographic screening. A systematic review. Psychooncology 2005.
4. Mitnick JS et al. Breast cancer malpractice litigation in New York State. Radiology 1993.

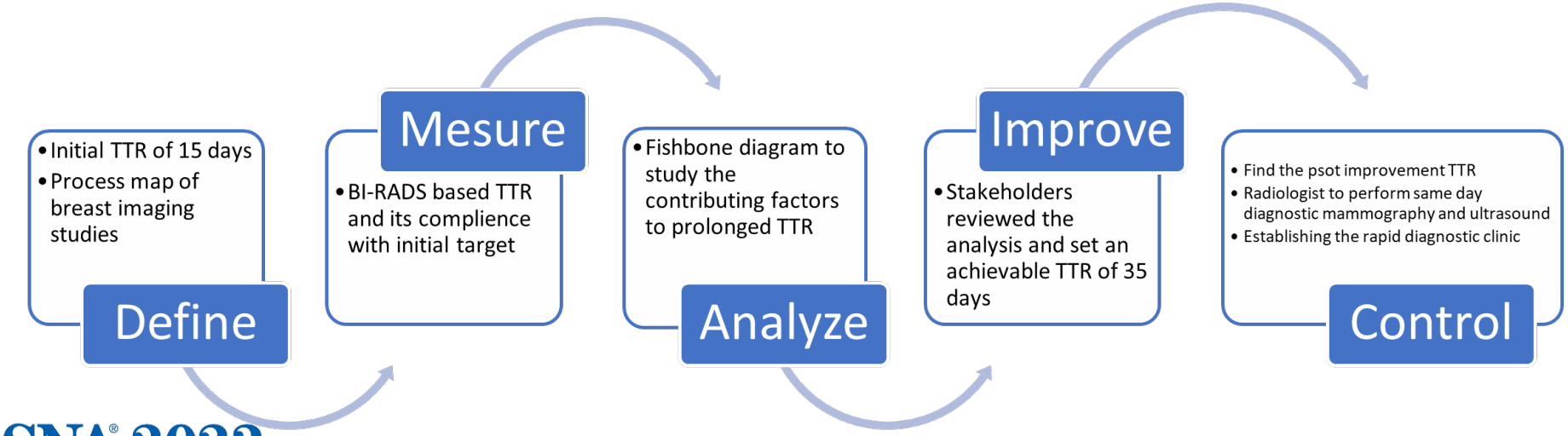
Problem Statement and Aim

- Breast imaging services often experience a significant degree of variability in patient flow, which leads to clinic inefficiency and delays
  - Increasing demand for screening mammograms was reflected by the **increase in the access time exceeding six months** in our publicly funded tertiary referral breast imaging service
  - There was an **increase in patients' complaints** reported to the patient relations department, related to delayed recalls for diagnostic mammography
- The primary aim of our study is to find the TTR of the screen-recalled cases, Breast Imaging Reporting and Data System (BI-RADS) category 0, as per the American College of Radiology recommendation[1], of women attending screening mammography

1. D'Orsi CJ et al. ACR BI-RADS® Atlas, Breast Imaging Reporting and Data System. Reston, VA: American College of Radiology; 2013.

Methods

- This project is part of the QI project initiated and approved by the Institutional Review Board at our center in Saudi Arabia
- Lean and Six Sigma are combined into Lean Six Sigma Methodology (LSSM), which is defined in healthcare as the discovery of the causes of a probable deviation of the process from its standard ideal, their removal, and the subsequent improvement of process performance[1]
- Project outline following DMAIC framework:



1. Montella E et al. The application of Lean Six Sigma methodology to reduce the risk of healthcare-associated infections in surgery departments. J Eval Clin Pract 2017.

Key Measures and Data Analysis

- An integrated electronic medical record system was put in place to track the TTR, collected as a continuous measure in days, from the time the screening study is inputted until diagnostic resolution is reached.
- A set **target TTR of 35** days was selected as a more achievable goal (21 days to diagnostic workup plus additional 14-day interventional procedures if needed) given the current shortage of nursing and radiologist staff
- Due to the abnormal distribution demonstrated by Shapiro-Wilk tests , the pre- and post-implementation TTR were assessed using the Mann-Whitney-U test on SPSS (v24, IBM Corporation, Armonk, USA)
  - Significance was adopted at $P < 0.05$ for the interpretation of the results of tests of significance

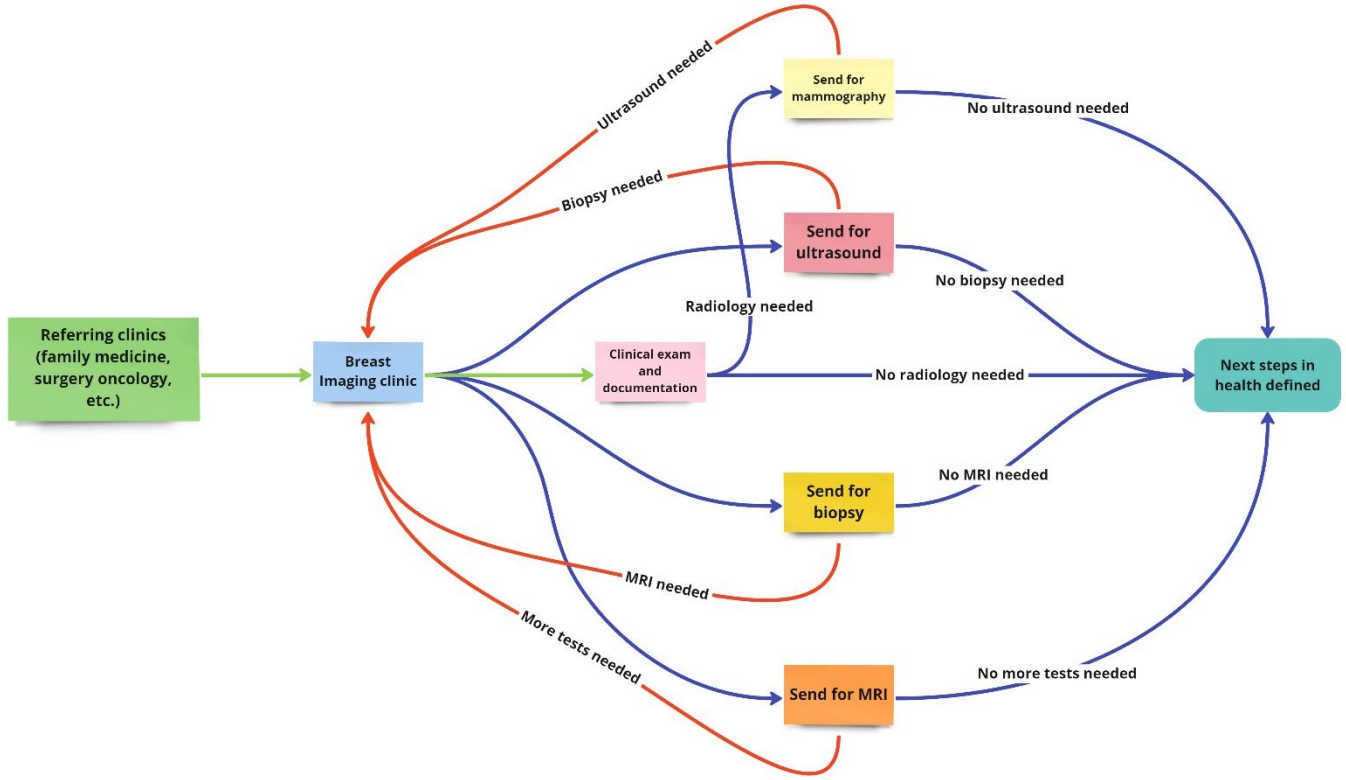
Results

Category outcome post-diagnostic evaluation	Pre-implementation No. of cases (N = 589)	Pre-implementation TTR (days)	Post-implementation No. of cases (N = 370)	Post-implementation TTR (days)	*P* value (pre-implementation VS post-implementation TTR)
BI-RADS 0	111 (18.8)	NA	99 (26.8)	NA	NA
BI-RADS 1 & 2	261 (44.3)	102.3	153 (41.4)	35.2	<0.01*
BI-RADS 3	168 (28.5)	103.1	78 (21.1)	28.5	<0.01*
BI-RADS 4 & 5	49 (8.3)	69.8	40 (10.8)	45.8	0.324
Total		**86.3**		**36.0**	**<0.01***

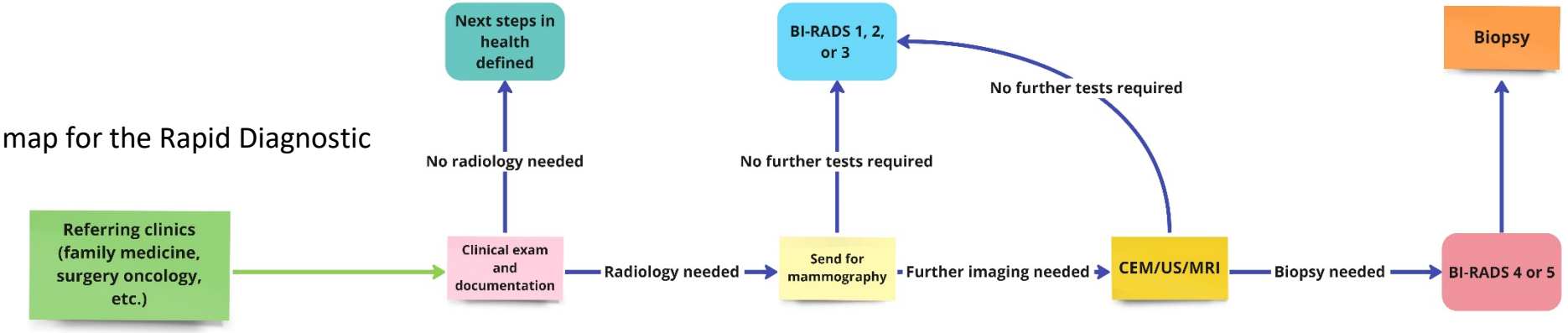
Average time to resolution (TTR) for screen-detected abnormalities comparing cases pre- and post-performance improvement. *: statistically significant (P < 0.05).

Results

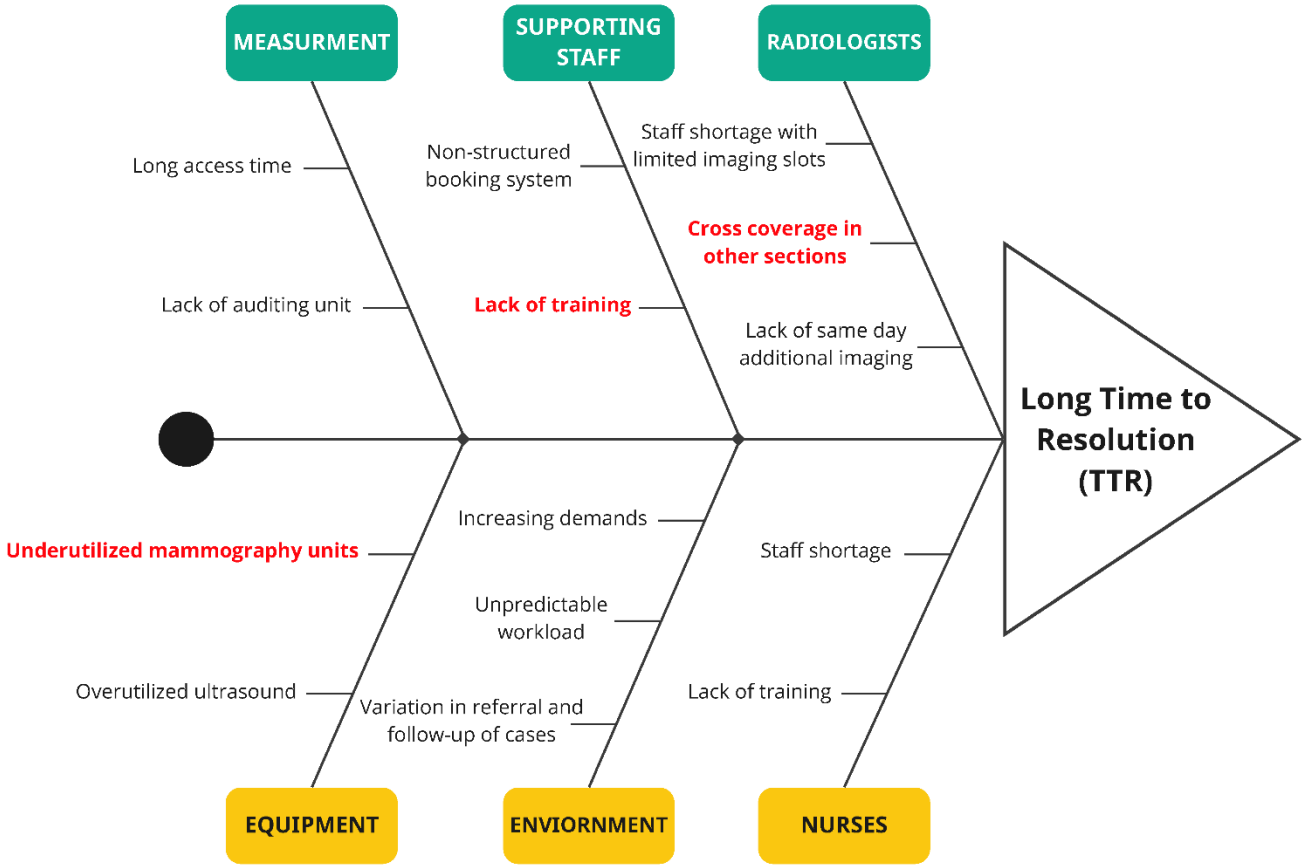
- **Pre-implementation** patient flow to and from the breast imaging section. The green arrows are the starting direction for all patients from the referring clinic. The red arrows reflect the need to go back to the clinic before proceeding further.



- **Post-implementation** process map for the Rapid Diagnostic Clinic.



Process Improvement



Ishikawa fishbone diagram outlining the internal factors contributing to delayed workup. Areas with the greatest impact are in red.

Proposed change/s
Introduce a rapid diagnostic radiology clinic to allow workup of recalled cases.
Train coordinators to manually capture the recalled cases and arrange for recommended examination and to monitor the outcome.
Train coordinators to use a formatted Excel sheet noting the time intervals between screening and diagnostic exams, the time between diagnostic exam and biopsy if needed, and the outcome. This was planned to assist in prioritizing all breast imaging examinations and to allocate more slots for interventional procedures if needed.
Make radiologists available for full-time breast imaging and encourage them to perform same-day additional imaging whenever possible, especially if the patient is from out of town.
Consider technologists only support of contrast-enhanced mammography and image-guided procedures.

Conclusion and Key Messages

- **By training the breast imaging coordinators to capture screen-recalled cases and to arrange for the recommended imaging test, we managed to significantly reduce the overall TTR by 58.3%**
- LSSM can enhance service delivery in the breast imaging section
- The key to successful process improvement is to involve all team members in working toward an achievable target using specific time-gauged tasks
- All stakeholders should actively explore the role of supplementary tools to have a sustainable, progressive, and more efficient patient flow