The Medical Outcomes Audit: A Team Approach to Understanding the Data and Sharing Results

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One of the most valuable tools in a successful mammography program is the medical outcomes audit (MOA). Unfortunately, many facilities and individuals rarely give enough credit to this report, not realizing it provides much more than the calculated statistics. The MOA, when fully understood and analyzed, provides motivation for success and solidarity among breast imaging teams.

The MOA is often initiated by lead technologists in the first quarter of each year. This audit can remain a daunting item on the list of tasks to be completed before the annual Mammography Quality Standards Act (MQSA) inspection. Many mammography tracking systems automatically track the outcomes audit data, but additional steps are required to effectively interpret and understand the data. An individual who is ready to complete this task may log in to the mammography tracking software system (if available), select the appropriate dates and parameters, print the report, and then provide it to the lead interpreting physician for review and signature. After the report is reviewed by the lead interpreting physician and other interpreting physicians, it is filed to demonstrate compliance upon MQSA inspection. "Little is known about how radiologists use and interpret the performance feedback" from this report, wrote Fenton et al.[1] Often, only the interpreting physicians and lead technologist see these data, and their reviewing process may take only a few seconds. Does this sound familiar? Do the numbers on the report really matter? Why are the data so important and what significance do they have for your entire team? In this article, we explain the MOA and why breast imaging radiologists and technologists should review these important reports.

What Is the Mammography Audit and Why Is It Valuable?

Although the MOA may be one of the most misunderstood and underutilized tools within an imaging team, it is a valuable method for evaluating the performance of a mammography program and the accuracy of mammographic interpretation. It is the only certain assessment of clinical outcomes in mammography, and it measures both technical and interpretive aspects of mammography performance. The MOA is a requirement of the MQSA and can be used in medicolegal defense. These are some of the countless benefits of tracking and understanding the data:

- Measuring a mammographer's success in finding small, curable cancers

- Assessing a technologist's positioning skills and identifying opportunities for improvement
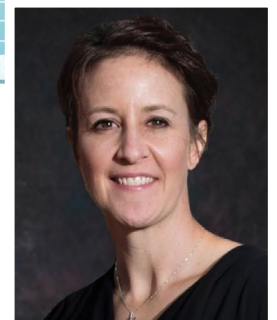
- Identifying false negatives and determining the cause so corrections can be implemented, preventing future shortcomings

- Ensuring all patients are followed through from their initial screening to final diagnosis

- Assessing referring clinician and patient compliance

- Improving referring clinician and patient compliance, if the data show good performance and are shared with others

Valuable Metrics: Why to Measure and What They Mean

Raw data must be collected and derived data must then be calculated for reporting metrics (Figure 1). Benchmark values for screening and diagnostic studies are different, so screening and diagnostic information must be collected and calculated separately. In addition, the cancer detection rate is much higher in patients presenting with symptoms than in those recalled from a screening examination for diagnostic evaluation.[2]

The following six metrics are important in creating a meaningful audit:

- Positive predictive value (PPV)

  - PPV1: percentage of screening examinations with abnormal findings that resulted in a diagnosis of cancer. This is a measure of perceptual skill and how well an individual perceives a cancer.

  - PPV2: percentage of cases recommended for biopsy because of a screening examination that resulted in a diagnosis of cancer. This is a measure of analytical skill, or how well an image was analyzed and a decision made to recommend biopsy or not.

  - PPV3: percentage of all biopsies actually performed because of a screening examination that resulted in a diagnosis of cancer. This is also referred to as the positive biopsy rate.

- Sensitivity

  - Probability of detecting a cancer when a cancer exists

  - Percentage of all patients found to have cancer within 1 year of a screening examination who were correctly diagnosed as having breast cancer at the time of screening

  - Accurate data for sensitivity are difficult to obtain because of the challenges of acquiring false-negative data. However, facilities that have access to a tumor registry or are part of a closed system can effectively accomplish this.

  - To some extent, measuring approximate sensitivity values on the basis of known false-negative cases can be useful.

- False negative

  - Diagnosis of breast cancer within 1 year of a screening mammography examination with normal findings

  - Should be measured and analyzed independently regardless of whether sensitivity can be accurately measured

  - An extremely important metric to measure and analyze for learning purposes and implementing practice improvements

  - Should be shared anonymously to establish a trustworthy environment that allows for effective evaluation and learning opportunities

- Specificity

  - Probability of normal mammography findings when no cancer exists

  - Percentage of all patients found not to have breast cancer within 1 year of a screening examination with normal findings

- Cancer detection rate

  - Screening cancer detection rate is the number of cancers found per 1000 patients screened.

  - Prevalent cancers are those found at first screening. Incident cancers are those found at subsequent screenings. It is useful to separate prevalent and incident cancers, if possible, so data can be calculated separately for truly accurate reporting.

  - Diagnostic cancer detection rate is the number of cancers found per 1000 patients presenting for diagnostic evaluation because of symptoms. Diagnostic cancer detection rates are typically much higher than screening cancer detection rates because patients present with symptoms.

- Recall rate

  - Percentage of patients undergoing screening examinations who are recommended for further imaging evaluation

  - It is important to know if a practice is detecting cancers within a reasonable number of recalls from screening.

Calculating and Interpreting the Data: Who Is Responsible?

The MOA data are sensitive and must be collected, calculated, and reported correctly. This requires team effort and designation of responsible individuals. The MQSA requires that facilities select an audit interpreting radiologist to review the report and share the information with other interpreting radiologists. The audit interpreting radiologist should select a lead individual or individuals to compile and analyze the data. Typically, this individual is a lead technologist or manager. It is imperative that this individual be trustworthy and well educated on each component within the audit. The lead individual must also have a solid understanding of the desirable outcomes. The data must be collected and analyzed in a consistent manner by all staff members. All locations and staff members within an organization should record and calculate data in the same manner, whether through an electronic reporting system or manually. Staff education sessions that target proper data collection and entry are beneficial in ensuring consistent and accurate results.

Sharing the Results: Who Benefits?

The MOA can be one of the most valuable assets to boost morale and drive motivation in a positive direction for the entire breast imaging team when information is shared in an effective manner. Once the data have been collected, calculated, and analyzed, it is crucial to share the statistical data with key individuals within a breast imaging team. Key team members include all interpreting radiologists, all staff technologists, leadership and administrative personnel, and referring clinicians. There are many benefits to sharing the data with key individuals.

Radiologists

The audit data are a reflection of the accuracy of mammographic interpretation. All interpreting radiologists should review the data and compare them to facility statistics and national benchmarks. Interpreting radiologists should receive a report of their individual statistics and be given the opportunity to review the report independently and privately. Image review of known false-negative cases is important to evaluate and assess for learning opportunities.

Technologists

The audit data are a reflection of the technologists' positioning skills. A facility that reports an optimal cancer detection rate, with a high percentage of detected cancers being small, is a direct reflection of the technologists' excellent work. This result is a team effort that begins with the technologists' images. False-negative case review is an opportune time to evaluate not only a radiologist's interpretive skills but also a technologist's positioning skills to assess whether poor positioning contributed to the false-negative case.

Administrators

Reporting valuable metrics provides administrators with solid evidence of how well the imaging team is performing. Most importantly, metrics include patient outcomes.

Finding a way to effectively share these data can be extremely

beneficial. Presenting the information to the entire team in an anonymous format with image review of false-negative cases can be effective for reporting results and engaging team members. Using visual aids such as graphs and charts can help provide additional understanding. Benchmarks should be clearly stated and displayed on graphs to ensure individuals have a clear understanding of the team's goals. It is helpful to present data with comparison to peers, comparison with published national benchmarks, and comparison over time (Figures 2 and 3).[3] The Breast Cancer Surveillance Consortium (https://www.bcsc-research.org) can be used to access updated national performance benchmarks.

Although the MOA may be tedious, it has the ability to strengthen and unify a breast imaging program when data are calculated, analyzed, and shared appropriately. During a time of high stress and anxiety in our working environment, focusing on the positive learning aspects of the MOA is imperative.
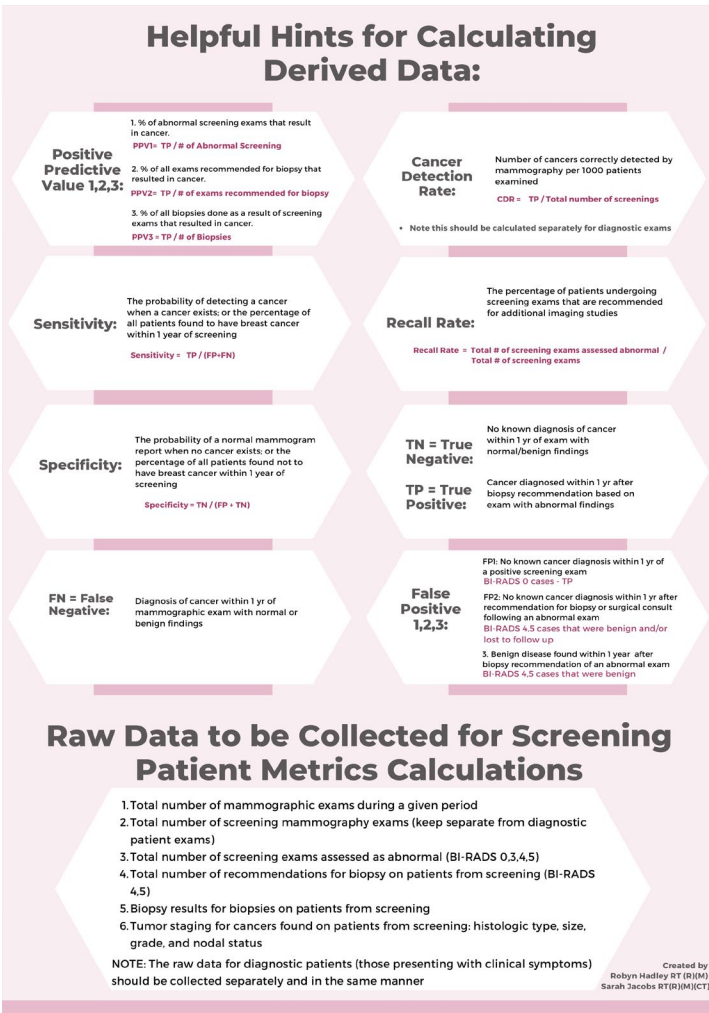
Acknowledgements

References

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2. Linver MN, Osuch JR, Brenner RJ, Smith RA. The mammography audit: a primer for the mammography quality standards act (MQSA). *AJR Am J Roentgenol.* 1995;165(1):19-25. doi:10.2214/ajr.165.1.7785586
3. Aiello Bowles EJ, Geller BM. Best ways to provide feedback to radiologists on mammography performance. *AJR Am J Roentgenol.* 2009;193(1):157-164. doi:10.2214/AJR.08.2051

Figure 1. Data calculations from medical outcomes audit. Created by Robyn Hadley, RT(R)(M), and Sarah Jacobs, RT(R)(M)(CT).

BCSC Benchmark	4.7				
GOAL	>2.5				
Cancer Detection Rate					
	2017	2018	2019	2020	2021
Radiologist A, MD	8.0	10.4	7.2	9.0	6.4
Facility	4.8	5.0	5.8	7.5	6.8
BCSC Benchmark	4.7	4.7	4.7	4.7	4.7

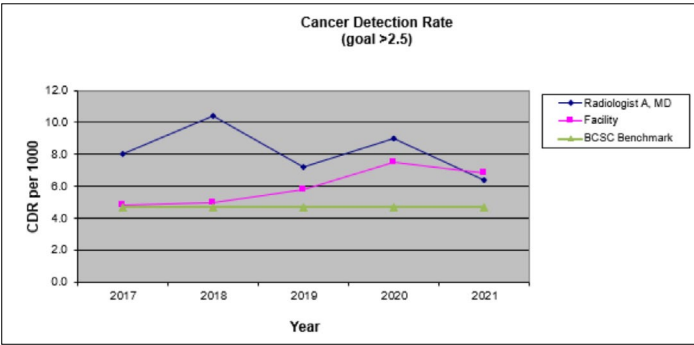**Figure 2.** Example of a cancer detection rate data presentation from a medical outcomes audit.

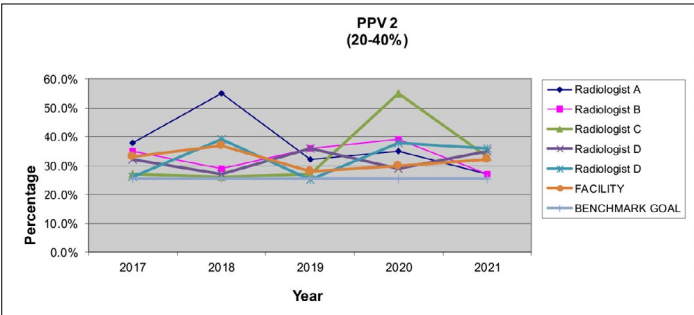| BCSC Benchmark	25.4%				
GOAL	20%-40%				
PPV 2					
	2017	2018	2019	2020	2021
Radiologist A	38.0%	55.0%	32.0%	35.0%	27.0%
Radiologist B	35.0%	29.0%	36.0%	39.0%	27.0%
Radiologist C	27.0%	26.0%	27.0%	55.0%	33.0%
Radiologist D	32.0%	27.0%	36.0%	29.0%	35.0%
Radiologist D	26.0%	39.0%	25.0%	38.0%	36.0%
FACILITY	33.0%	37.0%	28.0%	30.0%	32.0%
BENCHMARK GOAL	25.4%	25.4%	25.4%	25.4%	25.4%

Figure 3. Example of a positive predictive value 2 data presentation from a medical outcomes audit.