Waiting for a Diagnosis After an Abnormal Screening Mammogram

Ivo A. Olivotto, MD, FRCPC, Lisa Kan, MS, Sheila King, RTR on behalf of the SMPBC diagnostic process workgroup*

Regular screening mammography reduces breast cancer mortality.1-3 As a result, since 1987, organized breast cancer screening programs have been established in many jurisdictions in Europe, Australia and in all Canadian provinces. The process of screening does not make a diagnosis of cancer but rather identifies women with abnormalities who require additional diagnostic evaluation. It is recognized that reporting an abnormal screening result causes stress and anxiety for women.4-7 Delays in determining a definitive diagnosis may interfere with a woman’s productivity and may influence her compliance with re-screening.7,8

The responsibility for evaluation of an abnormal screening result rests with the screening program in the United Kingdom (UK) and Australia.9,10 Diagnosis is accomplished by referral to interdisciplinary assessment clinics which often operate one or two days per week and are affiliated with one or more screening centres.

In Canada, for historical reasons, except in certain areas,1,11,12 women with abnormalities identified during a visit to an organized breast cancer screening program are referred back to their family physician who takes primary responsibility for organizing the diagnostic evaluation, including referral for diagnostic imaging and if required, surgical consultation and biopsy. Concern has been expressed that such a system could be associated with inappropriate delays in the assessment of an abnormal screening mammogram.13-16 but, to date, there has been no published systematic evaluation of the timeliness of investigation after an abnormal screening mammogram in a Canadian organized breast screening program. This report details the sequence of steps and the magnitude of regional variation in the timeliness of assessment for women with abnormal screening mammograms detected through the Screening Mammography Program of British Columbia (SMPBC) in 1993-94.

MATERIALS & METHODS

Process

In July 1995, in response to screening participant feedback, the SMPBC established a Continuous Quality Improvement (CQI) project to: quantify the time between an abnormal screening result and definitive diagnosis, identify process gaps, and make recommendations regarding strategies to reduce the time to diagnosis after an abnormal screening result. An interdisciplinary group including consumers, family physicians, radiologists, surgeons, a Ministry of Health representative and SMPBC staff members* met six times over three months, to review data

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TABLE I

<table>
<thead>
<tr>
<th>Screening Service</th>
<th>Screening Volume</th>
<th>Number of Abnormals</th>
<th>Number of Cancers</th>
<th>Abnormal Call Rate</th>
<th>Biopsy Rate</th>
<th>Biopsy Yield Ratio</th>
<th>Positive Predictive Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10,498</td>
<td>694</td>
<td>38</td>
<td>6.6%</td>
<td>15.9%</td>
<td>33.6%</td>
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</tr>
<tr>
<td>B</td>
<td>6,462</td>
<td>327</td>
<td>29</td>
<td>5.1%</td>
<td>16.8%</td>
<td>52.7%</td>
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</tr>
<tr>
<td>C</td>
<td>13,626</td>
<td>818</td>
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<td>5.2%</td>
<td>16.4%</td>
<td>35.1%</td>
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<tr>
<td>D</td>
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<td>10.2%</td>
<td>7.4%</td>
<td>42.7%</td>
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</tr>
<tr>
<td>E</td>
<td>5,044</td>
<td>348</td>
<td>16</td>
<td>6.9%</td>
<td>12.7%</td>
<td>34.1%</td>
<td>2.6%</td>
</tr>
<tr>
<td>F</td>
<td>11,517</td>
<td>503</td>
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<td>4.4%</td>
<td>18.9%</td>
<td>32.6%</td>
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</tr>
<tr>
<td>G</td>
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<td>1488</td>
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<td>12.9%</td>
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</tr>
<tr>
<td>H</td>
<td>5,291</td>
<td>390</td>
<td>13</td>
<td>7.4%</td>
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</tr>
<tr>
<td>J</td>
<td>5,540</td>
<td>348</td>
<td>30</td>
<td>6.3%</td>
<td>18.1%</td>
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<td>8.6%</td>
</tr>
<tr>
<td>K</td>
<td>16,451</td>
<td>1018</td>
<td>49</td>
<td>6.2%</td>
<td>11.3%</td>
<td>42.6%</td>
<td>4.8%</td>
</tr>
<tr>
<td>All Services</td>
<td>108,495</td>
<td>7578</td>
<td>372</td>
<td>7.0%</td>
<td>13.2%</td>
<td>36.8%</td>
<td>4.9%</td>
</tr>
</tbody>
</table>

Notes:
- SMPBC denotes the Screening Mammography Program of British Columbia
- Abnormal call rate: percent of all screens called abnormal
- Biopsy rate: percent of abnormalities having a surgical biopsy
- Biopsy yield ratio: percent of biopsies with a diagnosis of invasive cancer or ductal carcinoma in situ
- Positive predictive value: percent of abnormalities found to be invasive cancer or ductal carcinoma in situ

TABLE III

<table>
<thead>
<tr>
<th>Screening Service</th>
<th>Median Number of Weeks</th>
<th>75th Percentile</th>
<th>90th Percentile</th>
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<tr>
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<td>5.9</td>
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<tr>
<td>C</td>
<td>3.3</td>
<td>5.7</td>
<td>9.0</td>
</tr>
<tr>
<td>D</td>
<td>3.1</td>
<td>5.1</td>
<td>8.3</td>
</tr>
<tr>
<td>E</td>
<td>3.9</td>
<td>5.7</td>
<td>8.0</td>
</tr>
<tr>
<td>F</td>
<td>3.0</td>
<td>5.0</td>
<td>7.9</td>
</tr>
<tr>
<td>G</td>
<td>4.7</td>
<td>6.9</td>
<td>9.9</td>
</tr>
<tr>
<td>H</td>
<td>5.0</td>
<td>6.0</td>
<td>10.1</td>
</tr>
<tr>
<td>I</td>
<td>3.9</td>
<td>5.1</td>
<td>8.4</td>
</tr>
<tr>
<td>J</td>
<td>2.6</td>
<td>4.3</td>
<td>7.1</td>
</tr>
<tr>
<td>K</td>
<td>2.7</td>
<td>4.3</td>
<td>7.1</td>
</tr>
<tr>
<td>All Services</td>
<td>3.4</td>
<td>5.6</td>
<td>8.7</td>
</tr>
</tbody>
</table>

Notes:
- Median – 50% of women had completed diagnostic investigation within the specified time
- 75th Percentile – 75% of women had completed diagnostic investigation within the specified time
- 90th Percentile – 90% of women had completed diagnostic investigation within the specified time

The SMPBC was initiated in July 1988. In January 1993, there were 14 screening centres organized as 11 screening services, including 1 mobile van covering approximately one third the area of the province. The SMPBC service included recruitment and registration, and performance and radiologist interpretation of annual, bilateral, two-view mammography (accessible with no personal charge) on self- or physician-referral for women aged 40 years and older. The SMPBC does not include a breast physical examination on site. Results of the screening visit (normal or abnormal) are mailed to the woman and her physician.

Active data collection by SMPBC Registry staff identifies all diagnostic interventions relating to the evaluation of an abnormal screening result. Data collection was completed within 6 months of the screening visit for 99% of women with an abnormal screening result. The type, date and result of each investigation after an abnormal screen were entered prospectively into the SMPBC database. SMPBC program results from 1993-94 are for screens performed in the fiscal year, April 1, 1993 to March 31, 1994. To increase sample size, diagnostic intervention data for women with abnormal screening results were examined for screens performed from January 1, 1993 to June 30, 1994.

RESULTS

The SMPBC provided a total of 108,495 examinations to 108,287 women in fiscal year 1993-94. Table I shows the overall and the service-specific screening volumes, abnormal call rates, biopsy rates, biopsy yield ratios and positive predictive values. There was a two-fold or greater variation between regional screening services for each parameter evaluated. Table II shows the proportion of women reported to have received various diagnostic investigations after their abnormal mammogram.

Between January 1, 1993 and June 30, 1994, 163,754 breast screening examinations were performed and 10,314 women (6.3%) were referred for assessment after an abnormal screening mammogram and were the study subjects. Of these women, 553 (5.4%) were diagnosed with in situ or...
invasive breast cancer. Table III shows the overall and service-specific time lag from screening visit to completion of the diagnostic evaluation. The overall median time to diagnosis was 3.4 weeks. The service-specific median time to diagnosis ranged from 2 to 4.7 weeks. The time to diagnosis was longer for those women requiring open biopsy: the overall median time was 7.1 weeks, and the service-specific median time ranged from 4.6 to 9.3 weeks. The median time to complete workup without an open biopsy was 2.6 weeks with 25% taking longer than 4.6 weeks and 10% taking longer than 7.7 weeks. Approximately one in three (36.8%) open breast biopsies yielded a diagnosis of in situ or invasive breast cancer (Table I). The service-specific median time to diagnosis for women with an eventual diagnosis of breast cancer was approximately two weeks shorter compared to the time to diagnosis for those women with a biopsy which was benign.

Although there were many different paths to diagnosis, the usual assessment sequence after an abnormal screening mammogram included reporting of screening results to the family physician and the woman, a physical examination by the family physician, diagnostic imaging work-up, and if recommended, surgical consultation and biopsy. The diagnostic imaging work-up may have included review of previous films, coned compression or magnification views, breast ultrasound, or combinations of these procedures. Figure 1 shows the usual sequence of assessment events and the provincial time intervals between events for women proceeding to open biopsy. For 81% of women, the diagnostic evaluation did not proceed beyond the imaging work-up. Six percent of imaging work-ups extended beyond one day. Fifteen percent of women had just one diagnostic procedure, and 83% had three or fewer procedures.

DISCUSSION

Women with abnormal screening mammograms wait a substantial time worrying about whether they have breast cancer.14,15 In spite of the fact that the vast majority of women with abnormal screening mammograms (nearly 95% in the SMPBC) do not have breast cancer, most women suffer considerable anxiety and disruption to their personal lives and that of their families.5-7 It is acknowledged that a delay of 6 to 11 weeks from abnormal mammogram to definitive diagnosis is not likely to influence ultimate survival from a mammographically detected breast cancer. However, the anxiety associated with the process for those women who do not have breast cancer is real and may reduce personal productivity, adversely affect family dynamics and could influence compliance with re-screening.7,8 Although women with an abnormal incident screen may be more likely to return
for subsequent screens at recommended intervals, the potential for a false positive result is described as a major negative consequence of screening. This negative consequence has been raised as a major limitation in the debate over whether to recommend screening for women age 40 to 49 years in whom the chance of an abnormal result is higher and the impact on mortality reduction is smaller than among women age 50-69 in whom there is consensus that regular screening mammography is beneficial.

We have observed substantial inter- and intra-regional variation in the time women wait for a definitive diagnosis after an abnormal screening mammogram. Our measured intervals are likely to be conservative estimates of the duration that the women are waiting because frequently additional time is required for diagnostic investigation results, either imaging or biopsy, to be formally reported and then communicated to women. For women who progress through the whole process to open biopsy, the longest component interval was the time between the imaging work-up indicating a biopsy was required and the biopsy being performed. During this time, the women had surgical consultation and then waited for time to be available in an operating room to have the biopsy. Greater use of imaging-directed percutaneous biopsy could reduce this interval for many women and reduce the number of women requiring open biopsy. Another possibility would be to make greater use of ambulatory care facilities and local anesthesia, rather than operating rooms and general anesthesia for the open biopsies, as it may be easier for surgeons to access outpatient facilities.

For women who just required diagnostic imaging evaluation, the median time between screening and completion of the work-up was nearly 3 weeks. Improving communication of results to family physicians and assisting family physicians to develop well-orchestrated processes for facilitating access to imaging could improve the overall screening experience for women. One mechanism to achieve facilitated access to imaging work-up is for screening programs to set up affiliated assessment centres. Such centres are an integral and mandated part of the UK and Australian national breast cancer screening programs. Experience suggests that such programs can improve the timeliness of the assessment process. In the broader Canadian context, screening centres are often widely dispersed and there is already a considerable infrastructure of diagnostic imaging facilities. It should be possible to re-organize processes such that facilitated assessment for women with abnormal screening mammograms can be accommodated within the current health care system. Efforts to optimize assessment for women with abnormal screening mammograms might also lead to more streamlined processes for women with symptomatic breast disease.

Diagnostic imaging work-up might include comparison with previous mammograms, magnification or further views of the breast, and ultrasound examination. There are a number of ways that better coordination could reduce the wait from notification of an abnormal screening result to completion of imaging work-up. Diagnostic facilities could reserve a few appointment bookings for women with abnormal screening results. The number of reserved appointments could be based upon recent experience of the number of cases evaluated each week in the anticipation of ongoing referrals from screening centres in the vicinity. Diagnostic facilities could also coordinate or expedite ultrasound bookings for those women in whom ultrasound is required. Excellent communication with the referring family physicians would be an integral component of such a facilitated process.

Facilitated processes to diagnostic imaging might also reduce the number of unproductive surgical referrals. For example, for a woman with a non-palpable abnormality, unless the imaging work-up has demonstrated that there is a definite abnormality requiring biopsy, there is little to be accomplished by surgical referral. Facilitated imaging work-up should therefore improve the process for women and promote the appropriate use of surgical resources. Delays in the diagnostic process may be contributed to by patient, provider or health system factors. It is recognized that shortening the diagnostic process may not be desirable for all women. Some women may want to wait because they have other obligations or priorities that take precedence over resolution of a screen-detected abnormality. Women’s choices should be respected. Anecdotal experience, however, suggests that the majority of women are anxious about an abnormal mammogram and want the ambiguity they are living with resolved as expeditiously as possible.

Based on the observation of wide variations in the time to definitive diagnosis between services and for individual women within a service, the CQI team concluded that it should be feasible to reduce the overall time to diagnosis. Using a consensus development approach, maximum timeliness targets for the diagnostic process were developed and subsequently adopted by the SMPBC and the BC Cancer Agency. It was agreed that the target maximum interval from screening to notification should be ≤ 3 working days; notification to completion of imaging should be ≤ 5 working days; imaging to surgical consultation a further ≤ 5 working days; and surgical consultation to biopsy also ≤ 5 working days. Achieving such targets would still result in a 4-week interval from screening to definitive diagnosis for those women requiring open biopsy. However, this would be a substantial improvement for many women. For example, if these targets were achieved, about 85% of women would have their abnormal screening episode resolved within 8 working days and the rest would have substantially shorter intervals to live with the uncertainty of an abnormal mammogram than existed in BC in 1993-94.

After developing the timeliness targets, the CQI data and interpretation were communicated to SMPBC staff and all screening radiologists. Key community practitioners from each regional screening service were invited to develop community-specific models to improve the diagnostic process. Five regions agreed to develop new diagnostic processes and have subsequently implemented changes in their communities with varying success. Other communities may have taken a less explicit approach and altered aspects of the diagnostic process as well.
To assess the impact of different community-specific diagnostic process changes initiated in these five volunteer communities, an interdisciplinary evaluation project, grant-funded by the National Cancer Institute of Canada, has begun. Prospective data on an array of endpoints are being collected for women screened through the SMPBC in 1998. This research project has been designed to quantify not only timeliness, but also aspects of client anxiety and satisfaction, and the health system costs or cost-savings of the process changes. Preliminary findings from this evaluation should be available in the year 2000.

**ACKNOWLEDGEMENTS**

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**REFERENCES**


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**ERRATUM**


In the abovementioned article, the figures were mislabelled:

Figure 1 should be Figure 5,
Figure 2 should be Figure 1,
Figure 3 should be Figure 2,
Figure 4 should be Figure 3,
Figure 5 should be Figure 4.

Interested readers may contact Prof. Sheila Innis for copies of the corrected figures, at the following coordinates:
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