2003/2004 Annual Report

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MESSAGE FROM THE PROVINCIAL CHIEF RADIOLOGIST

The 16th year of operation of the Screening Mammography Program of BC (SMPBC) has been marked both by refinements in operation and promotional activities as well as international recognition.

The Second Joint Forum of BC Women’s and the SMPBC held on October 17-18, 2003 attracted 306 registrants from various professional disciplines involved in breast care.

Five international experts, including Drs. Laszlo Tabar, Edward Sickles, Robert Smith, Wendie Berg, Michael Linver and Ms. Louise Miller, a renowned technologist educator, collaborated with local professionals in an acclaimed program: New Directions/New Questions. According to all reports, this educational endeavour was stimulating and thought provoking with its many skillfully presented cutting edge topics. All of us are grateful for the collaboration of the BC Women’s Hospital and Health Centre.

Later in the year, the Breast Tumour Group gave active consideration with a review of the current literature to published recommendations for screening. The final document was the basis for the updated information pamphlet which was published in August 2004.

In the 2003/2004 fiscal year, the SMPBC provided 222,549 screens to BC women. Province-wide participation of women in the 40-70 age group for the past 24 months was 42%.

Significant to the operation of the Program were the resignations respectively of Ms. Kathy Grabher, Provincial Screening Technologist Practice Leader, RTR, and Ms. Yulia D’Yachkova, Program Statistician. Ms. Grabher’s immense contribution to the Canadian Association of Radiologists (CAR) Accreditation for the screening centres and Ms. D’Yachkova’s to the analysis of data and preparation of manuscripts for publication have been of great benefit to the Program. We are enormously appreciative of the contributions of both these professionals. However, we are sure that their successors, Ms. Debbie Leatham and Mr. Chuck Paltiel will bring their own unique experience to these important posts.

Ms. Lisa Kan, our Screening Operations Leader since May 2003, has brought tremendous energy to her post. Together with Ms. Kan and Dr. Andy Coldman, we are grateful for the efforts of everyone including our technical, clerical and Central Office staff as well as the screening radiologists and family doctors. However, public support of our program and documented positive outcomes of screening, which in British Columbia continue to lead other provinces of similar population, are the ultimate measures of success. It is only with such team work that the progress for which the SMPBC has become widely acknowledged will be perpetuated.

Thanks to everyone for your contributions.

Dr. Linda Warren
Provincial Chief Radiologist

INTRODUCTION

The Screening Mammography Program of BC (SMPBC) has been in operation since 1988. There are currently 38 screening centres/services providing service to over 100 communities throughout the province.

The SMPBC provides two-view mammography, with staff and equipment that meet the national standards, to women in British Columbia between the ages of 40 and 79. The SMPBC will screen eligible women in other age groups with referral from the family physician. Women are not eligible for screening if they have had breast cancer, breast implants, or if they currently have breast symptoms requiring diagnostic investigation.

The Screening Process
The basic screening process can be described in three stages:
1. Identification and invitation of the target population
2. Provision of the screening examination
3. Investigation of abnormality identified on screening examination

Promotion, Recruitment & Recall
The SMPBC develops and distributes educational material to doctor offices, health units, libraries, and other interested organizations. The information brochures and cards are also available in a variety of languages.

A wide network of more than 300 volunteers has evolved informally since the start of the SMPBC. The volunteers assist with the recruitment of women in their communities, and the creation of a warm and welcoming environment for the screening appointments.

The SMPBC information system facilitates invitation and recall of eligible women for screening. With the support of the Ministry of Health, SMPBC accesses addresses from the Client Registry and generates individualized invitation letters for women turning 50 years of age each year. The SMPBC sends recall reminders to eligible women when they are due to return.

Facilitated Process to Diagnostic Investigation (Fast Track)
A linked “Fast Track” service for the diagnostic investigation of women with abnormal screening mammograms has been implemented with the cooperation of family doctors, and diagnostic radiology facilities across the province. This province-wide initiative reduces the time between an abnormal screening mammogram and the tests that will lead to a final diagnosis.

Fast Track aims to have the majority of women scheduled for further imaging studies within one week of the abnormal screening result.
SMPBC SCREENING PROCESS OVERVIEW

Program Promotion:
- Community promotion
- Physician education

Asymptomatic women aged 40-79

Personal Invitation to Screening
- sent to women turning 50 each year

Program Participants

Screening Visit

Result Communication
- to woman & physician

Diagnostic Investigation*

Normal/Benign

Cancer

Breast symptom found?

Yes

Diagnostic Investigation*

Normal/Benign

Cancer

No

Personal Reminder to Rescreen
- sent to women 40-79

Non-Participants

* SMPBC obtains diagnostic investigation information on women consent to follow-up from sources such as Medical Services Plan, surgeons, hospitals, and BC Cancer Registry.
Quality Assurance and Quality Control

Quality standards and systems in the SMPBC are developed based on recommendations provided by the Canadian Association of Radiologists (CAR), Health Canada, the Canadian Association of Medical Radiation Technologists (CAMRT), the BCCA Physics Department and scientific literature.

To assure the public of a quality service, the SMPBC follows the Quality Management process:

- Establish and regularly review Program standards
- Continually monitor processes to ensure established standards are met
- Take action to correct deficiencies in quality
- Follow up the action to ensure quality improvement

Quality screening is a shared responsibility of all staff. The SMPBC has dedicated resources to support quality assurance and quality control activities. For example, the Physicist Support Group monitors the mammography and film processing equipment, and provides professional direction in equipment selection, acceptance testing and trouble-shooting. The Provincial Screening Technologist Practice Leader works collaboratively with the Physicists and the Provincial Chief Radiologist to monitor image quality, and to support improvement by developing educational material and providing in-services. The SMPBC has established a goal to meet the Canadian Association of Radiologists (CAR) Mammography Accreditation requirements at all the screening clinics by 2005.

Evaluation

Data is collected and analyzed on an ongoing basis to understand the Program’s effectiveness and to identify areas for improvement. Results of this analysis are presented in the “Program Results” section of this report. Age specific breast cancer incidence and mortality rates are tracked in conjunction with the BC Cancer Registry.
PROGRAM RESULTS

Recruitment & Rescreening

The SMPBC provided 220,930 examinations to 220,891 women in 2003. Active participants of the SMPBC are defined to be those women who have attended the SMPBC at least once in the last 24-month period. In the 24-month period of 2002 and 2003, 386,373 women age 40 and over participated in the SMPBC. Age specific participation rates for all 16 Health Service Delivery Areas (HSDA) is shown in Table I. In each and every HSDA, the highest participation rates were seen in the 50-59 or 60-69 age groups. The province-wide participation rate for women aged 50-74 was 48%, a decrease of one percentage point from that reported last year. Participation in the East Kootenay continues to have the lowest in the province. Richmond and South Vancouver Island have the highest participation rate at 53%.

<table>
<thead>
<tr>
<th>Health Service Delivery Area</th>
<th>10-Year Age Groups</th>
<th>Age 50-74</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Vancouver Island</td>
<td></td>
<td>50%</td>
</tr>
<tr>
<td>East Kootenay</td>
<td></td>
<td>28%</td>
</tr>
<tr>
<td>Fraser East</td>
<td></td>
<td>47%</td>
</tr>
<tr>
<td>Fraser North</td>
<td></td>
<td>48%</td>
</tr>
<tr>
<td>Fraser South</td>
<td></td>
<td>46%</td>
</tr>
<tr>
<td>Kootenay Boundary</td>
<td></td>
<td>40%</td>
</tr>
<tr>
<td>North Shore/Coast Garibaldi</td>
<td></td>
<td>45%</td>
</tr>
<tr>
<td>North Vancouver Island</td>
<td></td>
<td>50%</td>
</tr>
<tr>
<td>Northeast</td>
<td></td>
<td>37%</td>
</tr>
<tr>
<td>Northern Interior</td>
<td></td>
<td>48%</td>
</tr>
<tr>
<td>Northwest</td>
<td></td>
<td>36%</td>
</tr>
<tr>
<td>Okanagan</td>
<td></td>
<td>52%</td>
</tr>
<tr>
<td>Richmond</td>
<td></td>
<td>53%</td>
</tr>
<tr>
<td>South Vancouver Island</td>
<td></td>
<td>53%</td>
</tr>
<tr>
<td>Thompson Cariboo Shuswap</td>
<td></td>
<td>48%</td>
</tr>
<tr>
<td>Vancouver</td>
<td></td>
<td>48%</td>
</tr>
<tr>
<td>British Columbia</td>
<td></td>
<td>48%</td>
</tr>
</tbody>
</table>

Table I
Regional Participation Rates by 10-Year Age Groups between 2002 and 2003 inclusive

Based on the average of 2002 and 2003 female population estimates

NOTES:
2. Population Data Acquired Through: the Health Data Warehouse, BC Ministry of Health
2003 Screening Results

Table II summarizes the outcome indicators for screening provided in the calendar year 2003 by 10-year age groups. Of the 220,930 screening mammograms performed, 15,686 had an abnormal result (7.1%) and 906 breast cancers were reported as of August 2003 (4.1 per 1,000 exams), including 210 in-situ cancers. For every age group, the abnormal call rate is lower on subsequent screens than on first screens. The overall abnormal call rate decreased with age between 40-49 and 70-79 from 8.6% to 5.4%. Cancer detection rates, positive predictive values and biopsy yield ratios increase with age.

### Table II

SMPBC Outcome Indicators by 10-Year Age Group

**Year: 2003**

<table>
<thead>
<tr>
<th>Age at Exam</th>
<th>&lt;40</th>
<th>40-49</th>
<th>50-59</th>
<th>60-69</th>
<th>70-79</th>
<th>80+</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Exams</strong></td>
<td>260</td>
<td>71,857</td>
<td>72,543</td>
<td>46,370</td>
<td>28,807</td>
<td>1,093</td>
<td>220,930</td>
</tr>
<tr>
<td></td>
<td>0.1%</td>
<td>32.5%</td>
<td>32.8%</td>
<td>21.0%</td>
<td>13.0%</td>
<td>0.5%</td>
<td></td>
</tr>
<tr>
<td><strong>Number of First Screens</strong></td>
<td>219</td>
<td>18,717</td>
<td>6,957</td>
<td>2,777</td>
<td>1,071</td>
<td>121</td>
<td>29,862</td>
</tr>
<tr>
<td></td>
<td>0.7%</td>
<td>62.7%</td>
<td>23.3%</td>
<td>9.3%</td>
<td>3.6%</td>
<td>0.4%</td>
<td></td>
</tr>
<tr>
<td><strong>Number of Cancers</strong></td>
<td>0</td>
<td>159</td>
<td>292</td>
<td>243</td>
<td>200</td>
<td>12</td>
<td>906</td>
</tr>
<tr>
<td></td>
<td>0.0%</td>
<td>17.5%</td>
<td>32.2%</td>
<td>26.8%</td>
<td>22.1%</td>
<td>1.3%</td>
<td></td>
</tr>
<tr>
<td><strong>Abnormal Call Rate</strong></td>
<td>8.8%</td>
<td>8.6%</td>
<td>7.0%</td>
<td>6.1%</td>
<td>5.4%</td>
<td>7.0%</td>
<td>7.1%</td>
</tr>
<tr>
<td>on first screens</td>
<td>9.1%</td>
<td>14.2%</td>
<td>15.5%</td>
<td>13.5%</td>
<td>11.6%</td>
<td>14.0%</td>
<td>14.3%</td>
</tr>
<tr>
<td>on subsequent screens</td>
<td>7.3%</td>
<td>6.6%</td>
<td>6.0%</td>
<td>5.6%</td>
<td>5.2%</td>
<td>6.1%</td>
<td>6.0%</td>
</tr>
<tr>
<td><strong>Overall Cancer Detection Rate (per 1,000)</strong></td>
<td>0.0</td>
<td>2.2</td>
<td>4.0</td>
<td>5.2</td>
<td>6.9</td>
<td>11.0</td>
<td>4.1</td>
</tr>
<tr>
<td>on first screens</td>
<td>0.0</td>
<td>3.4</td>
<td>5.5</td>
<td>9.0</td>
<td>9.3</td>
<td>24.8</td>
<td>4.7</td>
</tr>
<tr>
<td>on subsequent screens</td>
<td>0.0</td>
<td>1.8</td>
<td>3.9</td>
<td>5.0</td>
<td>6.9</td>
<td>9.3</td>
<td>4.0</td>
</tr>
<tr>
<td><strong>DCIS Detection Rate (per 1,000)</strong></td>
<td>0.0</td>
<td>0.6</td>
<td>1.1</td>
<td>1.2</td>
<td>1.1</td>
<td>0.9</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Positive Predictive Value of Screening Mammography</strong></td>
<td>0.0%</td>
<td>2.7%</td>
<td>6.1%</td>
<td>9.5%</td>
<td>14.6%</td>
<td>18.5%</td>
<td>6.1%</td>
</tr>
<tr>
<td><strong>Biopsy Yield Ratio</strong></td>
<td>---</td>
<td>21.2%</td>
<td>37.6%</td>
<td>47.3%</td>
<td>58.0%</td>
<td>68.8%</td>
<td>37.7%</td>
</tr>
<tr>
<td><strong>Benign:Malignant</strong></td>
<td>---</td>
<td>3.7 : 1</td>
<td>1.7 : 1</td>
<td>1.1 : 1</td>
<td>0.7 : 1</td>
<td>0.5 : 1</td>
<td>1.7 : 1</td>
</tr>
</tbody>
</table>

**NOTES:**
1. See glossary in the Appendix for definitions of terms.
2. Overall Cancer Rate includes ductal carcinoma in situ (DCIS)
3. Out of 15,686 cases called "abnormal", there were 12 lobular carcinoma in-situ cases and 445 outcomes unknown. The final number of cancers is still to be determined.
Diagnostic follow-up information is available on 15,239 (97.2%) of the abnormal screening mammograms to date. Women who did not provide written consent for SMPBC to obtain follow-up information account for the majority with missing information. Table III shows the proportion of women receiving specific diagnostic procedures as part of the work-up on their screen detected abnormalities. Overall, 11% of women with abnormal screening mammograms had an open biopsy. Figure 1 (next page) summarizes screening outcome.

**Table III**

Diagnostic Procedures Received by SMPBC Participants with "Abnormal" Screening Mammograms

Year: 2003

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Age at Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;40</td>
</tr>
<tr>
<td>Diagnostic Mammogram</td>
<td>87%</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>52%</td>
</tr>
<tr>
<td>Fine Needle Aspiration</td>
<td>4%</td>
</tr>
<tr>
<td>Core Biopsy</td>
<td>0%</td>
</tr>
<tr>
<td>Surgical Biopsy</td>
<td>0%</td>
</tr>
<tr>
<td>with Localization</td>
<td>4%</td>
</tr>
<tr>
<td>Number of Cases*</td>
<td>23</td>
</tr>
</tbody>
</table>

* with diagnostic assessment information available
Figure 1
Screening Outcome Summary
Year: 2003

220,930 Screens

Normal
205,243 (93% of total)

Abnormal
15,686 (7% of total)

Benign/Normal on Imaging Work-up
12,316 (79% of abnormals)

Further Diagnostic Work-up
2,925 (19% of abnormals)

No Follow-up Information Available
445 (3% of abnormals)

Core/FNA Only
1,316 (45% of diagnostic work-up)

Open Biopsy
1,609 (55% of diagnostic work-up)

Benign
1031 (79% of core/FNA)

Benign
285 (21% of core/FNA)

Benign
997 (62% of core/FNA)

Benign
612 (38% of core/FNA)
2002 Cancer Detection

Histologic features of breast cancers detected by SMPBC in 2002 are summarized by 10-year age groups in Table IV. Histologic features of breast cancer cases were obtained from the pathology reviews if available, otherwise from the original diagnostic reports. Invasive tumour size was determined from the best available source: (1) pathological, (2) radiological, (3) clinical. The TNM cancer staging was determined by assuming no regional lymph node involvement (N0) whenever axillary lymph nodes were not assessed, and no distant metastases (M0) unless otherwise informed.

### Table IV
Histologic Features of Breast Cancers Detected by SMPBC
Year: 2002

<table>
<thead>
<tr>
<th>Age at Exam</th>
<th>40-49</th>
<th>50-59</th>
<th>60-69</th>
<th>70-79</th>
<th>80+</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Cancers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>in situ</td>
<td>166</td>
<td>304</td>
<td>322</td>
<td>229</td>
<td>13</td>
<td>1,034</td>
</tr>
<tr>
<td>invasive</td>
<td>115</td>
<td>237</td>
<td>247</td>
<td>184</td>
<td>12</td>
<td>795</td>
</tr>
<tr>
<td><strong>Invasive Cancers with Staging Information</strong></td>
<td>114</td>
<td>236</td>
<td>246</td>
<td>183</td>
<td>12</td>
<td>791</td>
</tr>
<tr>
<td>TNM Staging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>75</td>
<td>152</td>
<td>172</td>
<td>135</td>
<td>7</td>
<td>541</td>
</tr>
<tr>
<td>II</td>
<td>35</td>
<td>73</td>
<td>62</td>
<td>38</td>
<td>3</td>
<td>211</td>
</tr>
<tr>
<td>III+</td>
<td>4</td>
<td>11</td>
<td>12</td>
<td>10</td>
<td>2</td>
<td>39</td>
</tr>
<tr>
<td><strong>Invasive Tumour Size</strong></td>
<td>14</td>
<td>26</td>
<td>28</td>
<td>13</td>
<td>1</td>
<td>82</td>
</tr>
<tr>
<td>≤5 mm</td>
<td>12%</td>
<td>11%</td>
<td>11%</td>
<td>7%</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>6-10 mm</td>
<td>23</td>
<td>45</td>
<td>56</td>
<td>67</td>
<td>4</td>
<td>195</td>
</tr>
<tr>
<td>11-15 mm</td>
<td>36</td>
<td>78</td>
<td>91</td>
<td>54</td>
<td>4</td>
<td>263</td>
</tr>
<tr>
<td>16-20 mm</td>
<td>14</td>
<td>40</td>
<td>29</td>
<td>27</td>
<td>2</td>
<td>112</td>
</tr>
<tr>
<td>&gt;20 mm</td>
<td>27</td>
<td>46</td>
<td>41</td>
<td>23</td>
<td>1</td>
<td>138</td>
</tr>
<tr>
<td><strong>Node Involvement</strong></td>
<td>73</td>
<td>149</td>
<td>175</td>
<td>134</td>
<td>9</td>
<td>540</td>
</tr>
<tr>
<td>no nodes sampled</td>
<td>8</td>
<td>18</td>
<td>16</td>
<td>25</td>
<td>3</td>
<td>70</td>
</tr>
<tr>
<td>no</td>
<td>81</td>
<td>165</td>
<td>185</td>
<td>132</td>
<td>6</td>
<td>569</td>
</tr>
<tr>
<td>yes</td>
<td>26</td>
<td>54</td>
<td>46</td>
<td>27</td>
<td>3</td>
<td>156</td>
</tr>
<tr>
<td><strong>Histologic Grade</strong></td>
<td>28</td>
<td>59</td>
<td>79</td>
<td>72</td>
<td>5</td>
<td>243</td>
</tr>
<tr>
<td>1 - well differentiated</td>
<td>25%</td>
<td>25%</td>
<td>32%</td>
<td>39%</td>
<td>2</td>
<td>42</td>
</tr>
<tr>
<td>2 - moderately differentiated</td>
<td>39</td>
<td>77</td>
<td>51</td>
<td>8</td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td>3 - poorly differentiated</td>
<td>25</td>
<td>46</td>
<td>45</td>
<td>20</td>
<td>2</td>
<td>17</td>
</tr>
</tbody>
</table>

Overall, 59% of cancers detected were in situ or stage I. Of the invasive cancers detected, 68% were ≤15 mm, 20% had invasion of the regional lymph nodes, and 17% were grade 3 (i.e. poorly differentiated) tumours. These overall outcome indicators met international targets recommended for screening programs.
CUMULATIVE MAMMOGRAPHY RESULTS

Outcome Indicators by Calendar Year

Outcome indicators by calendar year are summarized and displayed on Table V (see next page). The abnormal call rates on first and subsequent screens continue to be on the rise. The overall abnormal call rate in 2003 increased slightly over the preceding two years to 7.1%. Following the slight increase in last year’s cancer detection rate, the rate for 2003 returned to the norm of the previous 5 years. The biopsy yield ratio also shows an increasing trend during the 5-year period.

Regular record linkage with the British Columbia Cancer Registry enables the SMPBC to determine the number of non-screen detected (interval) cancers in SMPBC participants for each year. Sensitivity (i.e. probability of finding women with breast cancer) and specificity (i.e. probability of a negative mammography in women without breast cancer) by calendar year are shown in. The SMPBC conducts formal reviews, both blinded and retrospective, of all interval cancers in SMPBC participants.

Comparison of prevalence rate at first screen with the historical incidence rate prior to the onset of screening practice was introduced in previous annual reports to provide another measure of program performance. The expected age-specific incidence rates in the absence of screening were derived from the 1982 breast cancer incidence data reported for British Columbia. Since screening may be obtained outside of SMPBC, prevalent screens have been restricted to those women with no previous outside mammogram within 24 months of their first SMPBC encounter. Swedish two-county study showed a prevalence to expected incidence ratio of 3.09 for age 50-59 and 4.59 for age 60-69\(^1\), and had recommended the target of >3.0 for organized screening programs\(^2\). The annual prevalence to expected incidence ratios for age 50-79 were consistently above 3 from 1995 to 2001.
### Table V

**SMPBC Outcome Indicators by Calendar Year**  
**Years: 1999 - 2003**

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>5-Year Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Exams</strong></td>
<td>217,552</td>
<td>223,607</td>
<td>224,565</td>
<td>234,873</td>
<td>220,930</td>
<td>1,121,527</td>
</tr>
<tr>
<td>% first screens</td>
<td>25.4%</td>
<td>19.6%</td>
<td>15.3%</td>
<td>14.4%</td>
<td>13.5%</td>
<td></td>
</tr>
<tr>
<td><strong>Number of Cancers</strong></td>
<td>887</td>
<td>852</td>
<td>910</td>
<td>1,035</td>
<td>905</td>
<td>4,589</td>
</tr>
<tr>
<td>% on first screens</td>
<td>32.2%</td>
<td>24.9%</td>
<td>18.2%</td>
<td>15.7%</td>
<td>15.4%</td>
<td></td>
</tr>
<tr>
<td><strong>Abnormal Call Rate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>on first screens</td>
<td>7.1%</td>
<td>6.8%</td>
<td>6.9%</td>
<td>6.8%</td>
<td>7.1%</td>
<td>6.9%</td>
</tr>
<tr>
<td>on subsequent screens</td>
<td>12.0%</td>
<td>12.3%</td>
<td>13.4%</td>
<td>13.1%</td>
<td>14.3%</td>
<td>12.8%</td>
</tr>
<tr>
<td><strong>Overall Cancer Detection Rate (per 1,000)</strong></td>
<td>4.1</td>
<td>3.8</td>
<td>4.1</td>
<td>4.4</td>
<td>4.1</td>
<td>4.1</td>
</tr>
<tr>
<td>on first screens</td>
<td>5.2</td>
<td>4.8</td>
<td>4.8</td>
<td>4.7</td>
<td>4.9</td>
<td></td>
</tr>
<tr>
<td>on subsequent screens</td>
<td>3.7</td>
<td>3.6</td>
<td>3.9</td>
<td>4.3</td>
<td>4.0</td>
<td>3.9</td>
</tr>
<tr>
<td><strong>DCIS Detection Rate (per 1,000)</strong></td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>0.9</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Positive Predictive Value of Screening Mammography</strong></td>
<td>5.7%</td>
<td>5.6%</td>
<td>5.9%</td>
<td>6.5%</td>
<td>5.8%</td>
<td>5.9%</td>
</tr>
<tr>
<td><strong>Biopsy Yield Ratio</strong></td>
<td>40.5%</td>
<td>42.7%</td>
<td>42.1%</td>
<td>43.5%</td>
<td>37.9%</td>
<td>41.3%</td>
</tr>
<tr>
<td>Benign:Malignant</td>
<td>1.5 : 1</td>
<td>1.3 : 1</td>
<td>1.4 : 1</td>
<td>1.3 : 1</td>
<td>1.6 : 1</td>
<td>1.4 : 1</td>
</tr>
<tr>
<td><strong>Interval Cancer Rate (per 1,000)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-12 months</td>
<td>0.7</td>
<td>0.6</td>
<td>0.7</td>
<td>0.6</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>after first screens</td>
<td>0.49</td>
<td>0.66</td>
<td>0.41</td>
<td>0.83</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>after subsequent screens</td>
<td>0.81</td>
<td>0.60</td>
<td>0.72</td>
<td>0.58</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>13-24 months</td>
<td>0.80</td>
<td>0.72</td>
<td>0.74</td>
<td>0.48</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>Sensitivity</strong> (i.e. 1 - false negative rate)</td>
<td>84.8%</td>
<td>86.1%</td>
<td>85.8%</td>
<td>87.7%</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>Specificity</strong> (i.e. 1 - false positive rate)</td>
<td>93.2%</td>
<td>93.5%</td>
<td>93.5%</td>
<td>93.6%</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>Prevalence to Expected Incidence Ratio for Age 50-79 (target 2: &gt;3.0)</strong></td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

**NOTES:**
- Numbers are as reported to October 2004. The final number of cancers in 2003 is still to be determined.
- Overall Cancer Rate includes ductal carcinoma in situ (DCIS).
- See glossary in the Appendix for definitions of terms.
Outcome Indicators by Age

In the 5-year period from 1999 to 2003, the SMPBC provided 1,121,526 screening mammography examinations to 503,125 women. Outcome indicators for this 5-year period are summarized by 10-year age groups in Table VI. The abnormal call rate is generally lower for older ages. The risk of breast cancer increases with age, which is reflected in the higher cancer detection rates for older women. An increasing trend with age is observed in the positive predictive value of screening mammography, biopsy yield ratio and specificity.

Table VI
SMPBC Outcome Indicators by 10-Year Age Group
Years: 1999 – 2003 Cumulative

<table>
<thead>
<tr>
<th>Age at Exam</th>
<th>40-49</th>
<th>50-59</th>
<th>60-69</th>
<th>70-79</th>
<th>80+</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Exams</td>
<td>397,446</td>
<td>349,465</td>
<td>225,272</td>
<td>140,908</td>
<td>6,598</td>
<td>1,121,526</td>
</tr>
<tr>
<td>Number of Cancers</td>
<td>779</td>
<td>1,379</td>
<td>1,334</td>
<td>1,034</td>
<td>60</td>
<td>4,588</td>
</tr>
<tr>
<td>Abnormal Call Rate</td>
<td>7.8%</td>
<td>7.0%</td>
<td>6.2%</td>
<td>5.6%</td>
<td>6.9%</td>
<td>6.9%</td>
</tr>
<tr>
<td>on first screens</td>
<td>12.8%</td>
<td>13.6%</td>
<td>12.3%</td>
<td>11.5%</td>
<td>12.7%</td>
<td>12.8%</td>
</tr>
<tr>
<td>on subsequent screens</td>
<td>5.8%</td>
<td>5.9%</td>
<td>5.5%</td>
<td>5.1%</td>
<td>5.3%</td>
<td>5.7%</td>
</tr>
<tr>
<td>Overall Cancer Detection Rate (per 1,000)</td>
<td>2.0</td>
<td>3.9</td>
<td>5.9</td>
<td>7.3</td>
<td>9.1</td>
<td>4.1</td>
</tr>
<tr>
<td>on first screens</td>
<td>2.7</td>
<td>5.7</td>
<td>9.4</td>
<td>12.8</td>
<td>15.7</td>
<td>4.9</td>
</tr>
<tr>
<td>on subsequent screens</td>
<td>1.7</td>
<td>3.7</td>
<td>5.5</td>
<td>6.9</td>
<td>7.2</td>
<td>3.9</td>
</tr>
<tr>
<td>DCIS Detection Rate (per 1,000)</td>
<td>0.6</td>
<td>1.1</td>
<td>1.4</td>
<td>1.5</td>
<td>1.1</td>
<td>1.0</td>
</tr>
<tr>
<td>Positive Predictive Value of Screening Mammography</td>
<td>2.6%</td>
<td>5.6%</td>
<td>9.6%</td>
<td>13.1%</td>
<td>13.1%</td>
<td>5.9%</td>
</tr>
<tr>
<td>Biopsy Yield Ratio</td>
<td>23.9%</td>
<td>39.1%</td>
<td>52.7%</td>
<td>61.0%</td>
<td>66.7%</td>
<td>41.3%</td>
</tr>
<tr>
<td>Benign:Malignant</td>
<td>3.2 : 1</td>
<td>1.6 : 1</td>
<td>0.9 : 1</td>
<td>0.6 : 1</td>
<td>0.5 : 1</td>
<td>1.4 : 1</td>
</tr>
<tr>
<td>Sensitivity (i.e. 1 - false negative rate)</td>
<td>78.3%</td>
<td>85.0%</td>
<td>90.5%</td>
<td>91.6%</td>
<td>95.2%</td>
<td>86.8%</td>
</tr>
<tr>
<td>Specificity (i.e. 1 - false positive rate)</td>
<td>91.6%</td>
<td>92.4%</td>
<td>93.4%</td>
<td>94.4%</td>
<td>95.1%</td>
<td>93.9%</td>
</tr>
<tr>
<td>Prevalence to Expected Incidence Ratio for Age 50-79 (target ≥ 3.0)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
1. See glossary in the Appendix for definitions of terms.
2. Overall Cancer Rate includes ductal carcinoma in situ (DCIS).
3. Numbers are as reported to October 2004. The final number of cancers for 2003 is still to be determined.
Cancer Characteristics by Age

From the start of the Program in July 1988 to December 2002, 7,829 women have been found to have breast cancer through screen-initiated work-up. Histologic features of breast cancers detected by SMPBC cumulative to and including 2002 are summarized by 10-year age groups in Table VII. The 7 cases of cancer for women younger then 40 are included in the total but not listed in a separate column.

Internationally recommended targets have been achieved in all age groups. However, invasive cancers found in women age 40-49 tend to be larger, more likely to have grade 3 histology, and more likely to involve nodes than cancers found in the older women.

### Table VII

**Histologic Features of Breast Cancers Detected by SMPBC**

**Years: Cumulative up to and including 2002**

<table>
<thead>
<tr>
<th>Age at Exam</th>
<th>40-49</th>
<th>50-59</th>
<th>60-69</th>
<th>70-79</th>
<th>80+</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Cancers</td>
<td>1,303</td>
<td>2,154</td>
<td>2,391</td>
<td>1,815</td>
<td>159</td>
<td>7,829</td>
</tr>
<tr>
<td>in situ</td>
<td>406</td>
<td>31%</td>
<td>559</td>
<td>26%</td>
<td>495</td>
<td>21%</td>
</tr>
<tr>
<td>invasive</td>
<td>897</td>
<td>69%</td>
<td>1,595</td>
<td>74%</td>
<td>1,896</td>
<td>79%</td>
</tr>
<tr>
<td>Number of Invasive Cancers with staging information</td>
<td>871</td>
<td>1,559</td>
<td>1,877</td>
<td>1,463</td>
<td>140</td>
<td>5,913</td>
</tr>
<tr>
<td>TNM Staging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>519</td>
<td>60%</td>
<td>1,011</td>
<td>65%</td>
<td>1,334</td>
<td>71%</td>
</tr>
<tr>
<td>II</td>
<td>326</td>
<td>37%</td>
<td>498</td>
<td>32%</td>
<td>493</td>
<td>26%</td>
</tr>
<tr>
<td>III+</td>
<td>26</td>
<td>3%</td>
<td>50</td>
<td>3%</td>
<td>50</td>
<td>3%</td>
</tr>
<tr>
<td>Invasive Tumour Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤5 mm</td>
<td>87</td>
<td>10%</td>
<td>152</td>
<td>10%</td>
<td>159</td>
<td>8%</td>
</tr>
<tr>
<td>6-10 mm</td>
<td>168</td>
<td>19%</td>
<td>369</td>
<td>24%</td>
<td>513</td>
<td>27%</td>
</tr>
<tr>
<td>11-15 mm</td>
<td>251</td>
<td>29%</td>
<td>450</td>
<td>29%</td>
<td>627</td>
<td>33%</td>
</tr>
<tr>
<td>16-20 mm</td>
<td>134</td>
<td>15%</td>
<td>271</td>
<td>17%</td>
<td>271</td>
<td>14%</td>
</tr>
<tr>
<td>&gt;20 mm</td>
<td>230</td>
<td>26%</td>
<td>319</td>
<td>20%</td>
<td>307</td>
<td>16%</td>
</tr>
<tr>
<td>≤15 mm</td>
<td>506</td>
<td>58%</td>
<td>971</td>
<td>62%</td>
<td>1,299</td>
<td>69%</td>
</tr>
<tr>
<td>Node Involvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no nodes sampled</td>
<td>102</td>
<td>12%</td>
<td>169</td>
<td>11%</td>
<td>211</td>
<td>11%</td>
</tr>
<tr>
<td>no</td>
<td>557</td>
<td>64%</td>
<td>1,071</td>
<td>69%</td>
<td>1,338</td>
<td>71%</td>
</tr>
<tr>
<td>yes</td>
<td>238</td>
<td>27%</td>
<td>355</td>
<td>23%</td>
<td>347</td>
<td>18%</td>
</tr>
<tr>
<td>Histologic Grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 - well differentiated</td>
<td>225</td>
<td>26%</td>
<td>475</td>
<td>30%</td>
<td>576</td>
<td>31%</td>
</tr>
<tr>
<td>2 - moderately differentiated</td>
<td>330</td>
<td>38%</td>
<td>554</td>
<td>36%</td>
<td>738</td>
<td>39%</td>
</tr>
<tr>
<td>3 - poorly differentiated</td>
<td>225</td>
<td>26%</td>
<td>332</td>
<td>21%</td>
<td>336</td>
<td>18%</td>
</tr>
</tbody>
</table>

TNM staging was determined by using mammographic measurement whenever pathologic measurement of the tumour was not available, and by assuming N0 whenever nodes were not assessed, and M0 unless otherwise informed.
COSTING SUMMARY

Costing analysis for the current and previous fiscal years is summarized in Table VIII. The unit cost of screening mammography has increased in the last year, primarily due to the reduced number of screens provided (see notes below). In the recent years, there is a greater proportion of re-screens for which cancer detection is lower. This, among other factors, causes increase in the cost per cancer detected.

Financial reports for PHSA and BCCA are available at the PHSA website: (www.phsa.ca/WhoWeAre/Budget+Accountability).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of screens</td>
<td>219,994</td>
<td>224,917</td>
<td>225,064</td>
<td>232,951</td>
<td>222,549</td>
</tr>
<tr>
<td>Number of cancers Detected</td>
<td>884</td>
<td>827</td>
<td>966</td>
<td>961</td>
<td>945</td>
</tr>
<tr>
<td>Total Cost</td>
<td>$10,299,642</td>
<td>$11,358,867</td>
<td>$12,560,751</td>
<td>$13,016,098</td>
<td>$13,005,919</td>
</tr>
<tr>
<td>Total cost per screen</td>
<td>$46.82</td>
<td>$50.50</td>
<td>$55.81</td>
<td>$55.87</td>
<td>$58.44</td>
</tr>
<tr>
<td>Central Services</td>
<td>$9.30</td>
<td>$9.17</td>
<td>$8.90</td>
<td>$9.07</td>
<td>$8.85</td>
</tr>
<tr>
<td>Other operating costs</td>
<td>$29.03</td>
<td>$29.35</td>
<td>$31.35</td>
<td>$31.29</td>
<td>$34.26</td>
</tr>
<tr>
<td>Professional Reading Fees</td>
<td>$6.12</td>
<td>$9.36</td>
<td>$13.00</td>
<td>$13.39</td>
<td>$13.39</td>
</tr>
<tr>
<td>Capital Allocation</td>
<td>$2.37</td>
<td>$2.62</td>
<td>$2.56</td>
<td>$2.13</td>
<td>$1.93</td>
</tr>
<tr>
<td>Cost per cancer detected</td>
<td>$11,651</td>
<td>$13,735</td>
<td>$13,003</td>
<td>$13,268</td>
<td>$13,763</td>
</tr>
</tbody>
</table>

NOTES:

- Number of cancers detected in 2003-04 and cost per cancer is estimated because the final number of cancers is not determined yet.
- Cost per screen in 2003-04 reflects inability of centres to achieve assigned screens due to suspension of recall letters and unavoidable closures including SARS and forest fires in the Interior.
- Total cost in 2003-04 includes expenses incurred during the fiscal year but not paid until fiscal 2004-05. Annual costs have been revised to include tube replacement in 'other operating costs'.
- Capital allocation includes 1) capital differential allocated to privately administered centres in their annual operating budget and 2) amortization of equipment purchased through BCCA/PHSA. Capital allocation does not include capital expenditures capitalized and amortized through host hospitals.
- The professional reading fee was $8 per screen prior to December 2000, $12 effective December 2000 and $13.39 per screen effective April 2002.
- The Professional Reading Fee for 2001-02 includes retroactive reading fee paid in 2002-03.
ACKNOWLEDGMENT

The Screening Mammography Program of BC would like to thank its partners who have supported and contributed to the Program over the years. The success of the Program depends on an integrated system of:

- Community health professionals promoting the benefits of screening
- Dedicated and highly trained staff to process and read the screening mammograms
- Family doctors and medical specialists to provide diagnostic follow-up and treatment
- Community facilities providing space and personnel to support mammography

We would also like to thank the following organizations for their ongoing support:

- Women’s Health Bureau
- BC Medical Association
- College of Physicians and Surgeons
- Canadian Breast Cancer Foundation
- Alliance for Breast Cancer
- BC Women’s Health Centre
CONTRIBUTORS

*in alphabetical order

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Andrew J. Coldman</td>
<td>Leader, Population &amp; Preventive Oncology</td>
</tr>
<tr>
<td>Ms. Lisa Kan</td>
<td>Screening Operations Leader</td>
</tr>
<tr>
<td>Mr. Chuck Paltiel</td>
<td>Biostatistician, Surveillance &amp; Outcomes</td>
</tr>
<tr>
<td>Ms. Jennifer Sentell</td>
<td>Program Secretary</td>
</tr>
<tr>
<td>Dr. Linda Warren</td>
<td>Provincial Chief Radiologist</td>
</tr>
</tbody>
</table>
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Dr. Joanne Coppola
Interior/Kootenay Mobile
as at March 31, 2004
Islands and Coastal Mobile
as at March 31, 2004
Northern Region & Islands & Coastal Mobiles

as at March 31, 2004
The following is a list of publications and presentations relating to the SMPBC and/or breast screening:

**Peer-Reviewed Publications**

**Dr. Linda Warren**

Warren Burhenne LJ. **Screening Mammography Program of British Columbia, Standardized Test for Screening Radiologists Seminars in Breast Disease** September 2003;6(No.3):140 - 147.


Warren Burhenne LJ. **Routine Mammography is Associated with Earlier Stage Disease and Greater Eligibility to Breast Conservation in Breast Carcinoma Patients Age 40 Years and Older Breast Disease A Year Book Quarterly- Review** (In Press).

**Dr. Paula Gordon**


**Dr. Greg Hislop**


**Dr. Malcolm Hayes**


Peer-Reviewed Publications continued


Presentations and Lectures

Dr. Andy Coldman
“Predicting Breast Cancer Mortality Rates in women undergoing mammography screening”
International Biometrics Society Meeting
Sidney, Australia
July 6, 2004

Dr. Linda Warren
“Missed Cancers and Proficiency Benchmarks”
Society of Breast Imaging
Hollywood, California
April 12, 2003

“Computer-Aided Detection: Current Status and Future Prospects”
Society of Breast Imaging
Hollywood, California
April 14, 2003

“Artefacts and Normal Variants”
Physics for Radiology Residents
University of British Columbia
May 1, 2003

“Selection, Training, and Monitoring of Interpreting Physicians”
Radiological Society of North America
Chicago, Illinois
December 2, 2003

“Missed Breast Cancers WHAT DO THEY MEAN”
University of British Columbia - Grand Rounds
March 17, 2004
Presentations and Lectures continued

Dr. Paula Gordon
“Interventional Breast Ultrasound. World Class Breast Imaging”
Sponsored by Loma Linda University
Vancouver, B.C.
July 29, 2003

“Freehand Invasive Ultrasound for Breast Biopsy. Hands-on Workshop”
Radiological Society of North America Annual Meeting
Chicago, Illinois
November 30, 2003

“Techniques of Invasive Sonography. Hands-on Workshop”
Radiological Society of North America Annual Meeting
Chicago, Illinois
December 4, 2003

“Ultrasound for Supplementary Breast Cancer Screening”
Practical Radiology
Whistler, B.C.
February 11, 2004

“How to Effectively Sample Non-Palpable Breast Lesions: Radiology/Pathology Correlation”
Annual Meeting of the United Sataes - Canadian Division of the International Academy of Pathology.
Vancouver, B.C.
March 7, 2004

Dr. Greg Hislop
“New Directions for Mammography Screening Programs”
The Joint Forum of BC Women's and The Screening Mammography Program of BC
Vancouver, B.C.
October 17, 2003
Appendix
SCREENING PROGRAM OVERVIEW

Definition of Screening
Primary prevention of cancer involves changes of behavior or habits that reduce a risk e.g. stop smoking, low fat diet etc. Screening for cancer is a secondary prevention strategy.

Secondary prevention of cancer is distinguished from primary prevention in that it is an intermediate intervention that targets disease in process. Secondary prevention can reduce cancer morbidity and mortality by diagnosing invasive disease at an earlier, more favorable prognostic stage and detecting precursor lesions associated with some cancers that once eliminated, prevent progression to invasive disease.

Screening is “the application of various tests to apparently healthy individuals to sort out those who probably have risk factors or are in the early stages of specified conditions.”

Limitations of Screening
The decision to screen an at-risk population for preclinical signs of cancer is based on well-established criteria related to the disease in question and the screening tests that are used to identify individuals who may have occult disease. Although the overall objective of a screening program is to reduce morbidity and mortality from cancer, the goal of screening per se is the “application of a relatively simple, inexpensive test to a large number of persons in order to classify them as likely, or unlikely to have the cancer which is the object of the screen.” The emphasis on likelihood underscores the limits of what should be expected from screening (i.e. screening tests are not diagnostic tests). A person with an abnormal screening test does not have a definitive diagnosis until additional, more sophisticated diagnostic tests are completed. The emphasis on likelihood also is important because screening tests are inherently limited in their accuracy, which varies by test, cancer site, and individual characteristics. Although most of screening interpretations are accurate, it is inevitable that some individuals are identified as possibly having cancer when they do not, and screening tests fail to identify some individuals who do not have the disease. The comparative evaluation of accuracy versus error cannot be considered in absolute terms but rather should be evaluated in terms of the relative consequences of one or the other kind of error.

Organized Population Screening Program

To reduce morbidity and mortality from cancer in a population by screening, there must be coordinated and effective strategies to ensure acceptance and utilization of the established screening test. Since screening is targeted at asymptomatic women, the fine balance between maximizing benefits and minimizing undesirable effects must be maintained.

An organized approach to screening ensures that the target population has access to the screening service, and that it accepts and uses the services offered. This is achieved by including the following six program components:

1. Health Promotion
2. Professional Development/Education
3. Recruitment & Retention
4. Screening Test & Reporting
5. Follow-up
6. Evaluation/Research Partnerships

The relationships between these components are illustrated in the figure below. The success of screening is a shared responsibility of the team of individuals who work together to develop goals, set standards, monitor progress, and continue improvement in each of the six components.

Components of the Organized Screening Program

[Diagram showing the interconnections between the six components: Health Promotion, Recruitment & Retention, Screening Test & Reporting, Follow-up, Evaluation/Research Partnerships, and Professional Development Education.]
Screening Program Administration

Population & Preventive Oncology of the BC Cancer Agency (BCCA), under the auspices of the Provincial Health Services Authority (PHSA), focuses on early detection and prevention of cancer, and the development and provision of cancer information. Its areas of responsibilities include:

1. Cancer Control Research (Epidemiology)
2. Surveillance and Outcomes Unit (Data and Evaluation)
3. Cancer Information Centre (Libraries)
4. Hereditary Cancer Program
5. Provincial Cancer Screening Programs

The Division of Population and Preventive Oncology is responsible for the administration of two population screening programs: the Cervical Cancer Screening Program (CCSP), and the Screening Mammography Program of British Columbia (SMPBC). Currently, there are two administrative positions with responsibilities for both programs:

Screening Operations Leader (SOL)
Accountable to the Population and Preventive Oncology Leader, provides leadership in the coordination of the Cancer Screening Program processes within the BC Cancer Agency in collaboration with the various process representatives, oversees resource requirements such as staffing, equipment and space and is responsible for the planning, preparation and monitoring of the Screening Program budgets.

Screening Information Management Leader (SIML)
Accountable to the Screening Operations Leader, provides leadership to assigned staff and is accountable for technology development related to the implementation of the Screening Information Management Process for the Provincial Screening Programs within the BC Cancer Agency. The SIML works collaboratively at the screening centre, regional and provincial levels with the Screening Information Management Process and Cancer Control Process.

Data and Evaluation support for screening programs is provided by the Surveillance and Outcomes Unit.
SMPBC Screening Centre Management Models

CENTRAL OFFICE

HOSPITAL MANAGED CENTRES
- Funding based upon SMPBC Model and criteria specific to public (hospital) centres

PUBLIC CENTRES
- Fixed: *full screening
- Ancillary: (film reading only) (in computer with full service)
- Mobile

PRIVATELY MANAGED CENTRES
- Cost reimbursement based on actual data

PRIVATE CENTRES
- Funding based on SMPBC model and criteria specific to private centres
- Fixed: *full screening
- Mobile

ANCILLARY
- Mobile (film reading centres)

*recruitment, registration, film taking, processing and interpretation
SMPBC RECOMMENDATIONS

<table>
<thead>
<tr>
<th>Age</th>
<th>Requires Referral</th>
<th>Recall Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;40</td>
<td>Yes</td>
<td>will accept with primary health care provider referral</td>
</tr>
<tr>
<td>40-49</td>
<td>No</td>
<td>Recall letter annually*</td>
</tr>
<tr>
<td>50-79</td>
<td>No</td>
<td>Recall letter every 2 years*</td>
</tr>
<tr>
<td>80+</td>
<td>Yes</td>
<td>will accept with primary health care provider referral</td>
</tr>
</tbody>
</table>

*a 2nd reminder letter will be sent if no visit/appointment is made 4-6 weeks after the recall letter is sent

Age <40 (with primary health care provider referral only)

Primary health care providers may wish to refer women age <40 with a strong family history of breast or ovarian cancer (i.e. 2 or more 1st degree family members), to be screened at the SMPBC. These women may also benefit from discussion of breast cancer risks including genetic counseling and testing. Screening mammography is only one component of care for these higher risk families. The SMPBC asks that each screening exam for women age <40 be arranged by primary health care providers after consultation with a radiologist at the SMPBC centre of choice. The primary health care provider should provide the woman with a referral slip citing the approving radiologist screener’s name. Exception: For women whose 40th birthday is ≤3 months away, refer to the following policy

Age 40-79 (self-referral)

Following recommendations from the BCCA Breast Tumour Group, the SMPBC invites eligible women aged 40 to 79 to have a screening mammogram at least every two years. Research studies show that 25-30% fewer breast cancer deaths can be expected in women if they have regular screening mammograms between ages 50 and 69. To achieve this, at least 70% of eligible women in this age group must have regular screening mammography.

Age 80+ (with primary health care provider referral only)

Primary health care providers may wish to refer women age 80+ in good general health (life expectancy of 10+ years), for screening at the SMPBC. The possible benefits of screening mammography in light of other potential health concerns at this age should be discussed with the women. Therefore, the SMPBC asks that each screening exam for women age 80+ be referred by primary health care providers to the SMPBC centre of choice.

SMPBC Eligibility Criteria

All B.C. women between the ages of 40 to 79 who:

- Have no breast changes (e.g. new lumps, thickening, or discharge)**
- Can provide the name of a doctor to receive the results
- Have not had a mammogram within 12 months
- Have not had breast cancer
- Do not have breast implants
- Are not pregnant or breast feeding

** If women have noticed a new lump, thickening or discharge, we recommend that they see a doctor immediately.
PROMOTIONAL ACTIVITIES

The Central Office and a part-time community development worker work together to promote the services of the Screening Mammography Program of British Columbia.

- Educational/promotional material order form is sent to family doctors and interested organizations once a year.
- On request, information brochures, posters and appointment pads are distributed to doctor’s offices, libraries and health units.
- “Expert” speakers are available for health fairs, professional rounds and other events.
- Invitation letters are sent to women in BC who turn 50 (except women already in the SMPBC); reminder letter if woman has not responded in 6-8 weeks.
- Reminder letter to return for screening (according to SMPBC recommendations).
- Mobile van schedules are distributed to community newspapers, doctors offices, health units, businesses, and community organizations (e.g. First Nations centres seniors centres).
- Monitoring of mobile service demand with follow-up action as required (e.g. local media advertising).
- Part-time community development worker located in the Interior promotes mobile van visits, coordinates volunteers who assist with the mobile van, distributes publications throughout the community.
- On request, group bookings arranged for specific groups so that they can feel more comfortable and/or make appropriate travel arrangements (e.g. First Nations women, South Asian women, women living in remote communities). In the future, SMPBC hopes to secure a permanent mobile van to provide service to remote areas.

RESOURCES *(Available free of charge from Central Office)*

**Pamphlets**
Are you a woman over 40? *(Available in English and Chinese)*
What Happens When You Come for a Screening Mammogram *(Available in English, Chinese & Punjabi)*
After Your Screening Mammography *(Available in English, Chinese & Punjabi)*

**Posters/Flyers** *(mobile mammography)*
“The Mobile Breast Screening Service will be in your Community Soon”
“Did You Know…As You Get Older Your Risk Of Breast Cancer Increases?”

**Appointment Pads**
Lower Mainland Screening Mammography Centre Locations
1-800# to book Mammography appointments *(Available in English, Chinese and Punjabi)*

**Videos**
“A Step Ahead of Breast Cancer” (produced 1998) - Educational video about the importance of screening mammograms for the early detection of breast cancer.
GLOSSARY

**Abnormal Call Rate**
Proportion of screening mammography examinations determined to require further diagnostic assessment (ie. called "abnormal").

\[
\text{Abnormal call rate} = \frac{\text{number of exams called abnormal}}{\text{total number of exams}}
\]

**Biopsy Yield Ratio**
Proportion of cases biopsied that resulted in a diagnosis of breast cancer.

\[
\text{Biopsy Yield Ratio} = \frac{M_b}{B_b + M_b}
\]

- \(B_b\) number of cases with without breast cancer on screen-initiated biopsy
- \(M_b\) number of women found to have breast cancer on screen-initiated biopsy

**Biopsy Yield Ratio** which is sometimes referred to as **Positive Predictive Value of Biopsy**, can also be expressed as **Malignant:Benign Ratio** or **Benign:Malignant Ratio**.

\[
\text{Malignant : Benign Ratio} \Rightarrow \frac{M_b}{B_b} : 1
\]

\[
\text{Benign : Malignant Ratio} \Rightarrow \frac{B_b}{M_b} : 1
\]

**Cancer Detection Rate**
Proportion of screened cases found to have breast cancer upon further investigation of an "abnormal" screening result.

**Prevalent Cancer Detection Rate** is the cancer detection rate on first screening examinations

**Incident Cancer Detection Rate** is the cancer detection rate on subsequent screening examinations
Interval Cancer Rate
Proportion of women being diagnosed with breast cancer by within 12 months of having a “normal” screening result.

False Negative Rate
Probability of interpreting screening mammograms of breast cancer cases as “normal”.

\[
False\ Negative\ Rate = \frac{FN}{TP + FN}
\]

\[
TP\quad \text{number of breast cancer cases found at screening}
\]
\[
FN\quad \text{number of breast cancer cases diagnosed within 12 months of screening}
\]

False Positive Rate
Probability of interpreting screening mammograms of cases with no evidence of breast cancer as “abnormal”.

\[
False\ Positive\ Rate = \frac{FP}{TN + FP}
\]

\[
TN\quad \text{number of cases with "normal" screening mammograms that remained without evidence of breast cancer before the next screening visit, or within 12 months after the last screening visit}
\]
\[
FP\quad \text{number of cases with no evidence of breast cancer but whose screening mammograms were called "abnormal"}
\]

Positive Predictive Value (PPV) of Screening Mammography
Proportion of "abnormal" cases found to have breast cancer after diagnostic workup

\[
PPV = \frac{\text{number of 'screen - detected' cancers}}{\text{number of abnormals} - \text{number of unknowns}}
\]
Comparison between rate at first (prevalent) screen with historical incidence rate prior to onset of screening practice. Prevalent screens have been restricted to those women with no previous outside mammogram within 24 months of their first program screens. The 1982 incidence rates by 5-year age group obtained from the BC Cancer Registry were chosen as the comparison reference.

\[
P: I \text{ Ratio} = \frac{\sum C_{a_i}}{\sum N_i R_i}
\]

Where \(N_i\) is the number of prevalent screens for age group \(i\), \(C_{a_i}\) is the number of cancers detected in prevalent screens for age group \(i\), and \(R_i\) is the expected incidence rate for age group \(i\). Prevalence to expected incidence ratio for age 50-79 would be calculated by summing over age groups 50-54, 55-59, 60-64, 65-69, 70-74 and 75-79 in the numerator and denominator.

**Sensitivity**

Probability of interpreting screening mammograms of breast cancer cases as “abnormal”. It measures how well screening mammography determines the presence of breast cancer.

\[
Sensitivity = \frac{TP}{TP + FN}
\]

\(TP\) number of breast cancer cases called "abnormal"
\(FN\) number of breast cancer cases called "normal"

**Specificity**

Probability of interpreting screening mammograms of cases with no evidence of breast cancer as "normal". It measures how well screening mammography determines the absence of breast cancer.

\[
Specificity = \frac{TN}{TN + FP}
\]

\(TN\) number of cases with "normal" screening mammograms that remained without evidence of breast cancer before the next screening visit, or within 12 months after the last screening visit
\(FP\) number of cases with no evidence of breast cancer but whose screening mammograms were called "abnormal"