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### Mammography: The Norwegian Breast Cancer Screening Programme

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According to Maja Primic-Zakelj, at the Epidemiology and Cancer Registry Unit, Institute of Oncology, Ljubljana, Slovenia, "Population-based cancer screening using evidence-based tests has considerable potential to improve the health of the population, provided that programmes are implemented cost-effectively and with high quality". In this article, I will present information concerning the national Norwegian Breast Cancer Screening Programme (NBCSP) as an example that highlights how good organisation and continuous quality assurance can bring real results in terms of preventive healthcare.

#### Background & Origins

The NBCSP started as a pilot project in one of the 19 counties in November 1995, and became a nationwide programme in February 2004. Close to 550,000 women are currently in the target group, which is identified by a unique eleven-digit personal identification number given to all inhabitants in Norway by the population registry. The programme invites all women born in age cohorts corresponding to 50 - 69 years during the two-year screening period to a two-view mammography screening examination.

A personally addressed letter provides the exact time and place for the screening exam, which takes place at 26 stationary and four mobile mammography facilities. Twelve women can be examined each hour per mammography machine. Attendance is registered at the screening unit and automatically transferred to the cancer registry by an internal secure network (ISBN-based IP network). The attendance rate is about 77%, varying from 62% to 89% by county and screening round.

A leaflet about the programme and a self-administered questionnaire covering known risk factors for breast cancer are included with the invitation letter. The questionnaire is filled in by the women and is handed over to the radiographers when they show up for screening. The outcome of the questionnaire is used in the evaluation of the screening programme.

If women do not show up for screening, they are sent a reminder three to eight weeks after their scheduled examination. If an invitation is not desired, the women can notify the cancer registry, and they will not receive invitations unless that notification is canceled. The fee is approximately 30 euros, which covers the screening examination, diagnostic work-up and treatment.

#### Managing Recalls

Women recalled for diagnostic work-up receive a personal letter or a phonecall with the location and time for the workup, which takes place at an average of 15 days after the screening examination at 17 breast imaging centres at university or county hospitals. A work-up includes additional mammographic imaging and ultrasound, and a biopsy if needed. Most diagnostic work-up procedures are performed in one session. The NBCSP does not recommend short-term follow up.

During 10 years of performance, 4.6% of prevalent screened and 2.6% of the subsequent screened women were recalled due to mammographic findings. Some women are called back due to technical difficulties (0.7%) or due to symptoms reported when they show up for screening (0.4%). The cumulative risk of having a false positive recall during 20 years and 10 screening sessions is estimated to be 20%, while the risk of a false positive recall with biopsy is 4%.

The standard independent double reading with consensus is probably the main reason for the acceptable proportion of recalls in Norway. A

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consensus meeting dismisses about 50% of cases with a positive score given by one or both radiologists, but still the screening detection and interval cancer rates are acceptable.

## Key Figures from the Programme

About 38% of the women who were recalled due to mammographic findings had a biopsy, in which 41% of the biopsies stated ductal carcinoma in situ (17%) and invasive breast cancer (83%). The numbers correspond to a positive predictive value (breast cancer among those recalled) of 16%.

The proportion of biopsies among the recalled women increased by age, and was lower among subsequent screened compared with prevalent screened, while the proportion of cancers among all biopsies was higher among subsequent compared to prevalent screened. The detection rate during the first ten years of performance was six cancers (DCIS and invasive) per 1,000 prevalent screens and five per 1,000 subsequent screens. The rate increased by age. In addition to the screen-detected cancers, 18 cancers (8% DCIS and 92% invasive) per 10,000 screens were diagnosed in the period between two screening sessions in women with negative screening outcome. The screen detected tumours had an average tumour size of 15mm, while the interval cancers were 21mm. Positive lymph node involvements were seen in 25% and 44% of the screen-detected and interval cancers, respectively.

## Treatment & Follow-Up

Women diagnosed with breast cancer as a result of participation in the screening programme are treated and followed according to the guidelines of the Norwegian Breast Cancer Group. The treatment takes place at hospitals associated with the breast clinics. Establishment of the breast clinics, which include multidisciplinary teams, was one of the major issues in the implementation of the NBCSP. Prior to the screening programme, breast surgery was performed at about 60 hospitals. Today, all women with breast cancer are taken care of at 17 breast clinics, regardless of their age and detection mode. A recent study from Norway concludes that 33% of the improved survival from breast cancer after nine years follow-up is attributable to improved breast cancer management through multidisciplinary medical care.

A quality assurance manual was created contemporaneously with the start up of the pilot project in 1995/96. The manual was based on the recommendations given in the European guidelines and results from the randomised controlled trials, particularly in Sweden. Two revisions have been performed so far and it's about time for further revision. Based on the quality assurance manual, data are collected from the screening units and the breast clinics: The results of the radiological interpretation of the mammograms and subsequent imaging work-up results are reported electronically to the cancer registry, while the results of the biopsy and surgical treatments are reported on paper forms.

All information collected from the programme is entered into a database and distributed in files and programmes to the breast clinics. Data and results of early indicators are thus available for each county. The quality assurance manual is recommending regular site visits aimed at discussing these results. The Cancer Registry of Norway was established in 1951, and cancer has been a reportable disease by law since 1953. Consequently, the database of the registry is essentially complete with 99.6% of solid tumours reported.

## Early Indicators & Performance Measurement

Several studies have been performed based on data from the NBCSP. The majority of the studies are related to early indicators and performance measures. All the studies are showing promising outcome according to a future mortality reduction from the disease as a result of the implementation of the screening programme, but several challenges will appear in the estimations because the treatment of the disease has changed with time and because information about opportunistic screening is not available. In 2008, the government allocated about 15 million euros for external research groups to evaluate the screening programme. Different aspects will be explored and results are expected during 2012.

Contemporary, further programmes aimed at improved quality, in addition to research, are performed. Several research projects have arisen as a result of the outcome of the quality assurance and comparisons of results of early indicators. Attention has been on radiological performance, but future research will also include the aspects of pathology, treatment and follow-up.

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