

Breast Cancer Screening in Norway: Organization and Results

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The Norwegian Breast Cancer Screening Program (NBCSP) started as a four-year pilot project in four of Norway's 19 counties in 1995. The project was based on the European Guidelines for breast cancer screening and the experiences obtained from the randomized trials carried out so far, and it was planned after careful evaluation of the Swedish experience. The target group was women aged 50-69 years.

The aim of the pilot project was to obtain experience with the different organization models (stationary and mobile screening units, breast imaging centers) and to evaluate the process indicators of importance for a successful future nationwide screening program. The goal of the NBCSP was to reduce the mortality from breast cancer with 30% or more among the women invited to the program. The pilot project should be evaluated after two screening rounds (four years) before final decision whether a nationwide screening program should be implemented.

The process indicators achieved during the first two years fulfilled the recommendations, and the preliminary results (after the first screening round) were so promising that the Norwegian health authorities decided to expand the pilot project to become a nationwide program. In 1998 the government decided that breast cancer screening should be available for all women in Norway aged 50-69 years as soon as there were sufficient trained personnel available. Since February 2004 the NBCSP is a nationwide program. The target population in the year 2005 is about 485,000 women aged 50-69 years.

The NBCSP is governmentally founded and administered by the Cancer Registry of Norway. The Cancer Registry identifies women in the target group, schedules the screening examinations, ensures the completeness and the quality of the screening database and the process of running the program, create and distribute information to the target population and the public in general, and evaluates the program. Each county is responsible for managing the screening program in their county. The Norwegian Institute of Public Health is responsible for the mobile units and for sending invitations and reminders, and the Norwegian Radiation Protection Authority is responsible for the technical quality assurance.

The NBCSP invites all women in Norway, born in cohorts corresponding to 50-69 years, to a two-view (cranio-caudal and medio-lateral oblique views) mammography biannually. A unique 11-digit personal identification number given to all inhabitants identifies the women. Information about name, birth date, and address is transferred to a closed computer network from the Population Registry to the Cancer Registry. The data is updated according to moves, emigration, and deaths. This information is further merged with the women's mammography history in the NBCSP in order to achieve correct screening interval and to avoid invitation of diseased women. The invitation to attend the program is a personally addressed letter that provides exact time and place for screening examination. A leaflet about the screening program and a questionnaire covering known risk factors for breast cancer are at-

tached to the invitation letter. A fee of NOK 200 is charged from all women attending the program, which includes the mammography examination and medical expenses related to diagnostic work-up and any medical treatment. Women not attending the screening examination receive a reminder one to four months after their scheduled time. If further invitation is not desired, the women can notify the Cancer Registry.

The screening (mammography) examination takes place at 26 stationary and four mobile units. Attendance is registered and transferred from the screening unit to the Cancer Registry by an internal secure ISBN-based network. At the time of screening the women turn in the completed questionnaire and a signed informed consent. The consent confirms that data collected as part of the NBCSP can be used for evaluation and research purposes. The women are also interviewed about their breast history and clinical breast symptoms before the mammographic examination is performed.

The images are in general interpreted the following day (batch reading). Independent double reading is performed for all examinations in the NBCSP. The interpretations are recorded directly (transferred electronically) into the central database of the Norwegian Cancer Registry. A five-point rating scale for probability of cancer is used for the classification of the mammograms: 1=normal or definitely benign; 2=probably benign; 3=indeterminate finding; 4=probably malignant; and 5=malignant. This 5-point rating scale is not identical with the ACR's BI-RADS classification since most counties in Norway do not have a short-term follow-up for probably benign lesions. If at least one of the two independent readers categorize the mammographic finding as 2 or higher, the case is automatically selected for

discussion at the consensus/arbitration meeting usually held twice weekly. In addition, self-declared lumps and technically unsatisfactory quality of the mammograms are two further reasons for selection to the consensus meeting and eventually recall. If the information sent (electronically) to the Cancer Registry indicates a recall, then the diagnostic recall procedures carried out as well as the subsequent outcome must be registered in order to administratively finish the record of the woman. Incompleteness will be registered at the Cancer Registry and reminder letters will be sent. This reporting and monitoring system makes quality assurance and completeness of data possible. Screening informations from all 19 counties are registered in a central screening database. The Cancer Registry of Norway is one of the oldest in the world (established in 1951). All cancers diagnosed in Norway has been reported (by law) since 1953, and consequently this database is essentially complete (for 99.6% of all the malignancies). This cancer file is linked to the file of the NBCSP. Thus, an absolute surveillance of women in the screening program is given.

The medical staff at the Breast Imaging Centers have access to data obtained in their own county, and consequently has the possibility of conducting quality assurance and analysis on their own data. The Cancer Registry of Norway has, however, the superior responsibility for the quality assurance of the data and the process of running the NBCSP. The process indicators ("surrogate parameters" or early indicators), which are factors that provide information about whether a screening program is likely to achieve its goal of mortality reduction, is in accordance with the "European guidelines for quality assurance in mammography screening".

Some results (“surrogate parameters”) from the four-year pilot project:

Attendance rate:	First round	= 79.5% ;
	Second round	= 78.9%.
Recall rate (abnormal mammographic findings):	First round	= 4.2% (range, 3.5 - 4.9%).
	Second round	= 3.4% (range, 2.9 - 4.0%).
Cancer detection rate (invasive cancers + DCIS):	First round	= 0.68% (range, 0.59-0.83%).
	Second round	= 0.53% (range, 0.46-0.61%).
Rate of invasive cancers < 15 mm in diameter:	First round	= 52% (range, 46 - 59%).
	Second round	= 60% (range, 55 - 65%).

The results of the nationwide screening program (NBCSP) within the following years were - more or less - comparable with the results in the pilot project. Overview 31.12.2003:

Attendance rate:	Prevalent round	= 77.9%.
	Subsequent round	= 78.7%.
Recall rate (mammographic findings):	Prevalent round	= 5.4%.
	Subsequent round	= 3.9%.
Cancer detection rate :	Prevalent round	= 0.66% (DCIS 5.7%).
	Subsequent round	= 0.55% (DCIS 7.7%).
Positive predictive value (PPV) :	Prevalent round	= 15.6%
	Subsequent round	= 17.8%
Rate of invasive cancers < 15 mm :	Prevalent round	= 52% (range, 46 - 59%).
	Subsequent round	= 60% (range, 55 - 65%).
Positive axillary lymph nodes :	Prevalent round	= 24 %.
	Subsequent round	= 25%.
Mastectomy :	Prevalent round	= 70%.
	Subsequent round	= 34%.

The mastectomy rate is noticeable, clearly indicating the impact implementation of a screening program may have on the treatment of breast cancer nationwide.

Since February 2004, two counties are using full-field

digital mammography (FFDM) only, and three other counties have started with FFDM in the NBCSP. FFDM may have several potential benefits in population-based screening programs.