Screening Mammography Program of British Columbia: pattern of use and health care system costs

Evidence

Études

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Abstract

Background: The use of mammography for screening asymptomatic women has increased dramatically in the past decade. This report describes the changes that have occurred in the use of bilateral mammography in British Columbia since the provincial breast cancer screening program began in 1988.

Methods: Using province-wide databases from both the breast cancer screening program and the provincial health insurance plan in BC, the authors determined the number and costs of bilateral mammography services for women aged 40 years or older between Apr. 1, 1986, and Mar. 31, 1997. Unilateral mammography was excluded because it is used for investigating symptomatic disease and screening abnormalities, and for follow-up of women who have undergone mastectomy for cancer.

Results: As the provincial breast cancer screening program expanded from 1 site in 1988 to 23 in 1997, it provided an increasing proportion of the bilateral mammographic examinations carried out each year in BC. In fiscal year 1996/97, 65% of bilateral mammographic examinations were performed through the screening program. The cost per examination within the screening program dropped as volume increased. Thirty percent more bilateral mammography examinations were done in 1996/97 than in 1991/92, but health care system expenditures for these services increased by only 4% during the same period. In calendar year 1996, 21% of new breast cancers were diagnosed as a result of a screening program visit.

Interpretation: Substantial increases in health care expenditures have been avoided by shifting bilateral mammography services to the provincial screening program, which has a lower cost per screening visit.

Résumé

Contexte : L'utilisation de la mammographie à des fins de dépistage chez des femmes asymptomatiques a augmenté de façon spectaculaire au cours de la dernière décennie. Ce rapport décrit l'évolution de l'utilisation de la mammographie bilatérale en Colombie-Britannique depuis le début du programme provincial de dépistage du cancer du sein en 1988.

Méthodes : Se servant de bases de données provinciales tirées du programme de dépistage du cancer du sein et du régime provincial d'assurance-maladie de la Colombie-Britannique, les auteurs ont déterminé le nombre et les coûts des services de mammographie bilatérale dispensés à des femmes de 40 ans ou plus entre le 1er avril 1986 et le 31 mars 1997. On a exclu la mammographie unilatérale parce qu'elle sert à analyser une morbidité symptomatique et des anomalies du dépistage, ainsi qu'au suivi de femmes qui ont subi une mastectomie à cause d'un cancer.

Résultats : Pendant que le programme provincial de dépistage du cancer du sein passait d'un établissement en 1988 à 23 en 1997, il fournissait un pourcentage croissant des mammographies bilatérales exécutées chaque année en Colombie-Britannique. Au cours de l'exercice 1996/1997, 65 % des mammographies bilatérales ont été réalisées dans le cadre du programme de dépistage. Le coût par examen dans le cadre du programme de dépistage a diminué à mesure que le

volume augmentait. On a effectué 30 % de plus de mammographies bilatérales en 1996/1997 qu'en 1991/1992, mais les dépenses consacrées à ces services par le système de santé ont augmenté de 4 % seulement pendant la même période. Au cours de l'année civile 1996, 21 % des nouveaux cancers du sein ont été diagnostiqués à la suite d'une visite programme de dépistage.

Interprétation : On a évité d'importantes augmentations des dépenses consacrées aux soins de santé en transférant les services de mammographie bilatérale au programme provincial de dépistage, dont le coût unitaire par consultation de dépistage est moins élevés.

Since the mid-1980s the use of mammography has increased dramatically in North America[1,2] primarily as a result of the demonstration, by several randomized trials, that regular mammographic screening reduces breast-cancer-specific mortality rates.[3–6] This change has contributed to the recent increased incidence of breast cancer.[7,8] However, mammography, along with improvements in the treatment of breast cancer, has also been implicated in recent declines in deaths attributable to breast cancer.[7,8] Although organized breast cancer screening programs were initiated in all 10 Canadian provinces and the Yukon Territory between 1988 and 1998, there continues to be substantial use of mammography in diagnostic facilities.[1]

The Screening Mammography Program of British Columbia (SMPBC) was the first provincial breast cancer screening program in Canada when it was started in 1988. An initial goal of the program was to develop and implement both the service and quality-control measures to deliver high-quality screening mammographic examinations safely and efficiently. An additional objective was to deliver the service at a cost substantially lower than was feasible in the fee-for-service system. This was to be accomplished by delivering the service through sites set up to rapidly screen a large number of women while maintaining high standards of quality.

The purpose of this study was to determine the impact of the provincial breast cancer screening program since 1988 on the patterns of use of mammographic examination and on health care system expenditures for bilateral mammography in BC. Other endpoints of the SMPBC have been described elsewhere.[9–12]

Methods

The SMPBC, a program of the BC Cancer Agency, was initiated as a pilot program at a single site in Vancouver in July 1988. Its continuing goal has been to provide annual bilateral, 2-view mammographic examination at no personal charge to women 40 years of age and older on a self- or physician-referred basis. Recruitment is aimed at women aged 50 to 74 years of age. The program does not include physical breast examination on site.

The rate of expansion of the SMPBC and the location of additional sites have been determined by community interest, client demand and a gradual increase in resources from the BC Ministry of Health. As of Mar. 31, 1997, there were 23 sites employing a variety of delivery methods, including 3 mobile units. Of the 20 sites with fixed-site machines and year-round access to screening mammography, 14 were performing over 6000 screening examinations per year; all of these were "reading" sites, where films are interpreted and stored. The remaining 6 fixed sites were carrying out between 500 and 2000 screening examinations per year. Films obtained at these ancillary centres are sent by courier to the nearest reading site for interpretation and storage. Ancillary centres usually operate 1 or 2 days per week.

Five of the reading centres and the 6 ancillary centres are located in, and administered by, community hospitals on contract with the SMPBC. Three of the reading centres are administered by community hospitals but are located in 2 shopping malls and an office building. An additional 5 reading sites are administered by private radiologist partnerships on contract with the SMPBC and are located in medical office buildings (3) and shopping malls (2). One reading centre is administered directly by the central office of the SMPBC. The experience of this site is used when the SMPBC is establishing levels of reimbursement, including clerical and technologist staffing standards, space and equipment allocations, and reimbursement for expendable supplies. The mobile units are administered by 3 private radiologist groups, 2 of which also operate fixed reading centres.

The SMPBC service includes performance of the screening examination, interpretation by a radiologist, central data collection, reporting of results to the woman and her family physician, quality control and outcome analysis.[9] Each mammogram is read once only by a radiologist; the radiologists read the films in batches of 50 to 100 examinations per hour (4 films per examination) for an interpretation fee of $5.88 per screening examination (1996/97 rate). In March 1997 the program used the services of 40 radiologist screeners, who were each expected to interpret a minimum of 3000 mammograms per year.

The SMPBC maintains a cost-reimbursement operating model. This means that the program contracts with private and public facilities to deliver the screening service, monitor and adhere to program-wide quality standards, and submit data for central analysis and reporting. Reimbursement rates are established on the basis of the experience of the centre operated by the central office, union wage rates for public facilities, and periodic market surveys for rent and wages in the private sector. A single information system supports audit and reporting functions. Invitation and recall letters as well as the

results reported to the women and their physicians are sent from the central office in Vancouver.

Data were obtained from the SMPBC database regarding the number of screening services provided, the number of cancers detected and the overall expenditures for each fiscal year (Apr. 1 to Mar. 31) between 1988/89 and 1996/97. Before 1990/91 the SMPBC was a pilot project. The program's annual operating and capital expenditures from 1990/91 to 1996/97 inclusive were obtained from audited financial statements. To calculate the SMPBC cost per screening examination, the audited financial expenditures for each fiscal year were divided by the total number of examinations performed during the same period. To calculate the SMPBC cost per cancer detected in 1996/97, the overall SMPBC cost was divided by the number of cancers detected as a result of investigations initiated because of an abnormal SMPBC screening result.

Mammographic screening services provided by other facilities in BC are reimbursed through the universal-access provincial medical services plan (MSP). For calculating these screening costs, data from the MSP were restricted to billings for bilateral mammography (to eliminate, to the extent possible, diagnostic services, since unilateral mammography is used for symptomatic disease, investigation of screening abnormalities and follow-up of women who have undergone mastectomy for cancer). The number of these examinations and related expenditures for each fiscal year since 1986/87 was provided by the Ministry of Health. The 1996/97 MSP fee for a bilateral mammogram was $73.66, including technical and professional components.

Results

Fig. 1 shows the number of screening examinations provided by the SMPBC as it grew from a single pilot site in 1988/89 to 23 sites in 1996/97. Between 1988/89 and 1996/97 the SMPBC provided a total of 765 392 screening examinations for 298 676 women. As the number of examinations increased, the cost per examination decreased. In 1996/97, 167 221 mammographic examinations were provided to 166 851 women for an audited cost of $45.94 per examination, including the $5.88 professional interpretation fee. Seventy-six percent of these examinations were for women returning for a second or subsequent visit to the SMPBC. Women less than 50 years of age accounted for 28.9% of those screened; 53.9% were 50 to 69 years old; and 17.2% were 70 years of age and older.

In 1996/97, 505 breast cancers were diagnosed during investigation of women with abnormal SMPBC screening results. This represents 21% of all newly diagnosed cases of breast cancer in BC during this interval. The 1996/97 SMPBC cost per cancer detected was $15 211. This does not include the cost of investigations after the screening examination nor the cost of treatment.

Between fiscal years 1986/87 and 1996/97 inclusive, nearly 2 million bilateral mammographic examinations were provided to women aged 40 and older in BC, through either the MSP or the SMPBC. The annual number of these examinations increased 460% over this interval (Fig. 2). Since 1993/94, over half of the bilateral mammographic exams performed annually in the province have been done through the SMPBC. In 1996/97 this proportion rose to 65.3%. The annual number of bilateral mammographic examinations performed in BC increased more rapidly between 1986/87 and 1991/92 than between 1991/92 and 1996/97.

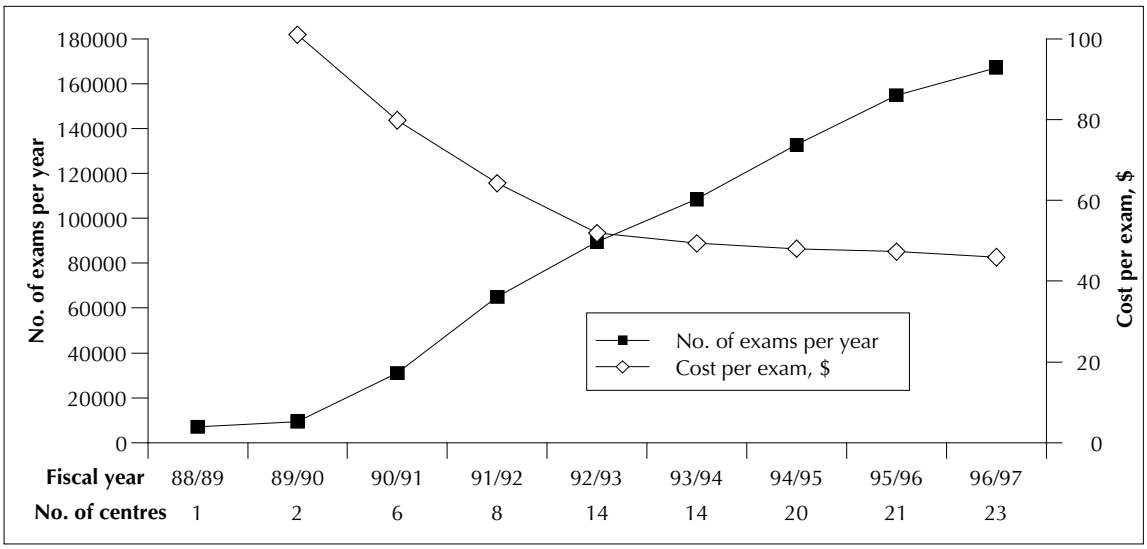

Fig. 1: Number of screening examinations and cost per examination of the Screening Mammography Program of British Columbia (SMPBC) from fiscal year (Apr. 1 to Mar. 31) 1988/89 to 1996/97. As the program expanded from 1 to 23 sites, the number of exams increased and the cost per exam fell substantially. The estimate of the cost per exam for the first, pilot-project year is not comparable and is not presented.

Fig. 2 also shows the total annual provincial health care expenditures for bilateral mammography. These expenditures increased from 1986/87 until 1991/92, the year during which the largest number of bilateral screening examinations were provided through the MSP. Since 1991/92, as the cost per screening examination in the SMPBC has dropped and the proportion of screening examinations done by the program has risen, annual provincial health care system expenditures for these services have remained relatively constant, at approximately $14 million. The number of bilateral mammographic examinations performed in BC increased by 30.1% (i.e., by 59 293 examinations) between 1991/92 and 1996/97, whereas expenditures increased by only 4.3% (i.e., by $0.6 million). If screening costs had increased at the same rate as number of examinations, the total expenditure for these examinations in 1996/97 would have been $17.6 million.

Interpretation

In this report we have documented a substantial shift in the provision of bilateral mammographic examinations from the diagnostic sector to the organized breast cancer screening program in BC from 1988 to 1997. Since 1991/92 there has been a 30% increase in the total number of bilateral mammographic examinations performed annually in BC, with only a 4% increase in health care system expenditures for these services. As the proportion of all screening examinations performed within the SMPBC has increased, the reduction in the cost per exam has offset the need for an overall increase in resources. Mechanisms for funding bilateral mammographic examination in the diagnostic sector did not change during this interval.

In Canada, the proportion of bilateral mammographic screening examinations performed within the diagnostic sector is unknown but has been estimated at as high as 80%.[1] The ability to shift mammographic screening services into an organized screening program may have several benefits to the health care system as a whole. These include an organized program of quality control and improvement, centralized data collection and outcome evaluation, and an organization responsible for recruitment and promotion of screening. Recruitment would target those women who stand to benefit from screening since, in Canada, at present, rates of use of mammography by age do not correlate well with the stated policies of provincial screening programs.[1,13] For example, women in their 40s and those over the age of 70 years seek out screening services regardless of whether they meet the eligibility criteria to undergo screening in the organized provincial programs.[1,13]

The improved cost efficiency with which bilateral mammographic examinations are now delivered in BC is related to the lower cost of a bilateral screening examination in the SMPBC than in the diagnostic sector and may not be directly translated into other health care jurisdictions. The cost per screening exam is related to the components of the service provided and the extent to which organizational and administrative efficiencies are implemented. The SMPBC does not include a physical breast examination on site, as do some provincial screening programs. Rather, family physicians are expected to do this examination as part of a woman's regular medical care. It

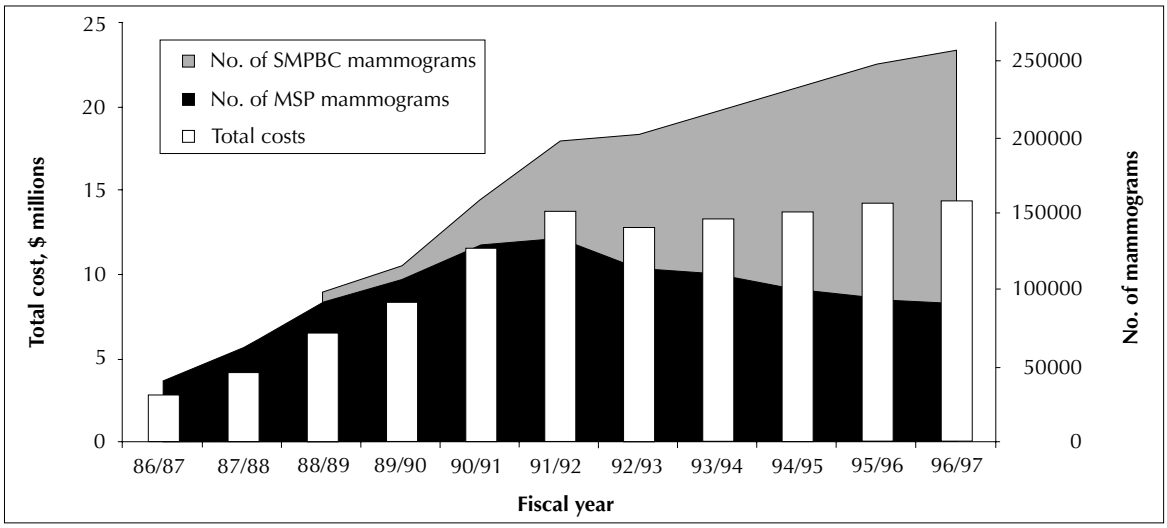

Fig. 2: Number of bilateral mammographic examinations provided for women aged 40 and older in BC and their cost to the health care system from fiscal year 1986/87 to 1996/97. The SMPBC, since its inauguration in 1988, has provided an increasing proportion of screening examinations in BC. The total number of bilateral mammographic exams increased by 30.1% between 1991/92 and 1996/97 while screening costs increased by only 4.3%. Costs reported during the SMPBC pilot project year (1988/89) may be an underestimate of the total cost of services that year.

is not known whether the addition of dedicated professional examiners for physical breast examination within organized screening programs is a cost-effective way to reduce death due to breast cancer.[14] In addition, the SMPBC has so far allocated relatively fewer resources for program promotion and recruitment than some other provincial programs, yet it is one of the most widely implemented programs in Canada.[1]

The SMPBC has established a funding model with fixed and variable reimbursement components based on program-wide standards and centralized services for many activities. This model provides efficiencies of scale. The SMPBC administrative team has regularly sought ways to develop cost efficiencies so that the cost of central services and the overall cost per screening exam has fallen steadily.[10] Recent improvements include working with Canada Post to lower mailing costs, establishing reduced film costs reflecting market trends, mechanizing and streamlining clerical support and data follow-up functions, and working toward electronic capture of follow-up data.

In 1996/97 a substantial number of women were still undergoing bilateral mammographic examinations funded through the MSP, some of which would have been for screening. There are several reasons why women may be reluctant to use the SMPBC. They may have become accustomed to the care received previously in conveniently located diagnostic offices, and their attending physicians may find it difficult to change referral patterns. In several districts of BC, women do not have immediate or year-round access to the SMPBC. In addition, some women may have inaccurate perceptions about the quality of the mammographic exam or the level of service available in a population-based screening program.

The success of an organized breast cancer screening program can be measured in many ways.[15–18] Such programs frequently report rates of participation by age and geographic location, and record such endpoints as rates of abnormal calls and cancer detection and the prognostic profile of the cancers detected.[15–18] SMPBC performance as measured by these endpoints has been reported elsewhere.[9–12] In a publicly funded program, the costs must also be considered. Such costs include the overall program cost, the cost per screening exam, the cost per cancer detected and, ultimately, overall cost-effectiveness, as measured by the cost per year of life gained. In 1996/97 the SMPBC cost per screening exam was $45.94 and the cost per cancer detected was $15 211. These values are conservative estimates of the overall cost to the health care system, as they do not incorporate the diagnostic costs associated with further examination of women with abnormal screening results, the cost of treatment or any costs borne by the women participating.

In summary, we have shown that by using a system in which objectives included high-quality service and minimization of costs, the SMPBC has been able to provide an efficient service for bilateral mammographic examinations. Organized breast cancer screening programs should accept the imperative that efficiencies need to be sought, which means, among other things, the minimization of cost per screening exam. This will make it easier for health care planners and policy-makers to support the continued development and expansion of organized breast cancer screening programs and for society to reap the benefits of an organized system for delivering these services.

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