ORIGINAL ARTICLE

Opportunistic breast cancer screening* in Hong Kong; a revisit of the Kwong Wah Hospital experience

CY Lui 呂振英
HS Lam 林漢城
LK Chan 陳立堅
KF Tam 譚國輝
CM Chan 陳志梅
TY Leung 梁冬陽
KL Mak 麥江寧

Objective To analyse the performance of opportunistic breast screening in local Well Women Clinics during the 5-year period from 1998 to 2002, with reference to international as well as our own earlier experience (1991 to 1993 to 1995).

Design Prospective study.

Setting Well Women Clinics in regional Hong Kong hospitals.

Participants Women attending the Well Women Clinics of the Tung Wah Group of Hospitals for breast cancer screening.

Main outcome measures All screening-detected breast cancers.

Results After 46 637 screening mammograms and excluding palpable masses detected by the patients themselves, 232 women were detected with cancers, yielding a crude detection rate of 5.0 per 1000. Age range for cancer detection was 35 to 72 (median, 49) years. Clinic staff detected palpable lumps in 83 patients, constituting 36% of the detected cancers, of which 15 (6.5% of all detected cancers) were not identified by mammography. The cancer detection rate was 5.9 per 1000 in the age-group 40-49 years and 3.7 per 1000 in those 50 years or older. The cancer detection rate was 58.5 per 1000 in the high-risk group (aged <40 years with positive family history). The minimal cancer detection rate was 2.2 per 1000, representing 45% of all cancers whose pathology was available to us. Ductal carcinoma in situ comprised 28% of all such cancers. Our recall rates were 4.6% for additional views only, 3.3% for ultrasound only, and 2.3% for both. Positive predictive values for abnormal mammograms and biopsies were 4.9% and 26.0%, respectively.

Conclusion Mammographic screening has been reported to reduce mortality up to 35% in western countries. However, data concerning Asian Chinese populations are meagre. Our Well Women Clinics pioneered large-scale self-referred breast screening in Hong Kong. Despite the lower incidence of breast cancers than in Occidental populations, our screening programme performed comparably to those in the West, and has improved over time. Our screening service for self-referred women detected breast cancers even at an early stage, which facilitated a better prognosis and more treatment options, whilst appearing to be highly acceptable to our community. Besides, it could provide training and expertise in breast radiology and mammography, which are essential prerequisites for establishing population screening.

* In this paper opportunistic mammography screening refers to individually chosen access by asymptomatic women to a mammography examination that is not a response to an invitation in the context of a mammography screening programme.

Key words
Mammography; Ultrasonography, mammary

Hong Kong Med J 2007;13:106-13

Kwong Wah Hospital, 25 Waterloo Road, Kowloon, Hong Kong:
Department of Radiology
CY Lui, MB, ChB, FHKAM (Radiology)
HS Lam, MB, BS, FHKAM (Radiology)
LK Chan, MB, BS, FHKAM (Radiology)
KF Tam, MB, ChB, FHKAM (Radiology)
Department of Surgery
CM Chan, MB, BS, FHKAM (Surgery)
Department of Pathology
KL Mak, MB, BS, FHKAM (Pathology)
Well Women Clinics, Tung Wah Group of Hospitals, Hong Kong
TY Leung, MB, BS, LMCHK

Correspondence to: Dr CY Lui
E-mail: luicy01@ha.org.hk

Introduction

Breast cancer is the commonest malignancy in women worldwide; more than 1 million new cases were diagnosed in 2000.[1] In Hong Kong too, since 1994, it ranks the highest in terms of cancer incidence among women and accounted for 21% of all female cancers in 2002.[2]

Breast cancer screening has been carried out in many countries and evidence from randomised controlled trials and service screenings claims significant mortality reductions.[3-17] Around the world, there are two types of breast screening programmes, namely, population screening and opportunistic screening. Population screening is organised by the government and all women of a suitable age are invited to partake, with the aim of reducing overall breast

cancer mortality. There are standard protocols and quality assurance programmes with accreditation processes for screening centres and their staff. Opportunistic screening is based on individual centres, with the aim of detecting breast cancer. Women attending such screening services are self-referred and have to pay the initial costs. Individual centres have their own standards and quality control procedures. Opportunistic screening can test the acceptance of the screening method in the population and usually precedes population screening.

In Hong Kong, there is currently no population screening of breast cancer. The Well Women Clinics organised by the Tung Wah Group of Hospitals were the first and presently the largest comprehensive self-referred breast screening programme established in Hong Kong and has been offering mammography screening since 1993.

In 1998, we published a report on our screening service covering the period from 1993 to 1995.[18] This paper aimed to revisit our service and discuss the role of this type of opportunistic breast screening for the Chinese population in Hong Kong.

Methods

Two Well Women Clinics offered breast cancer screening service to asymptomatic healthy women in Hong Kong on a self-referral basis. They were in easily accessible, city centre locations on both sides of Victoria Harbour; one at the Kwong Wah Hospital on the Kowloon Peninsula and another at the Tung Wah Eastern Hospital on Hong Kong Island. For each woman visiting either Well Woman Clinic, relevant clinical history including breast complaints, previous breast operations, family history of breast cancer, and other risk factors for breast cancer were documented and a clinical breast examination was performed by a dedicated clinician. Patients who had themselves detected a palpable mass in their breasts, were referred directly to the 'symptomatic' breast clinic for immediate assessment so as to avoid delaying the diagnosis, and were therefore excluded from this study.

Mammography was offered to all women aged older than 40 years as well as to those aged 35 to 40 years if they had a positive family history of a first-degree relative with breast cancer at a premenopausal age. For women over 70 years of age, there was currently no study on the benefits and harm of screening mammograms. For the latter age-group, mammograms were performed if at all, only after discussion with the clinician. Our screening interval was 2 years.

Both Well Women Clinics had installed conventional film-screen mammogram machines. Kwong Wah Hospital used the Lorad MIV machine (LORAD, Danbury, US) and Tung Wah Eastern Hospital the GE Senographe DMR (GE Medical System, Milwaukee, US). Film processors were Kodak daylight loader ML 300 Plus (Kodak, US).

乳癌的機會性篩檢：廣華醫院的經驗回顧

目的 參照國際經驗和香港早期經驗（1991至1993至1995年），分析本地醫院婦女健康普查部在1998至2002年五年間乳癌機會性篩檢的情況。

設計 前瞻研究。

安排 香港分區醫院的婦女健康普查部。

參與者 在東華三院婦女健康普查部接受乳癌篩檢的女性。

主要結果測量 通過篩檢偵測到的乳癌。

結果 本研究共檢視乳腺X射線影像46 637例，扣除病者自檢所摸到的腫塊外，篩檢共偵測到232位女性患上癌症，粗偵測率為每千人5.0人。接受乳癌偵測的研究對象年齡介乎35到72歲（中位數49歲）。醫護人員在83位病者身上摸到腫塊，佔偵測到的乳癌36%，其中有15例（佔所有偵測到的癌腫6.5%）並非通過乳腺X射線成像術發現的。40至49歲年齡組癌腫偵測率為每千人5.9人，而50歲或以上年齡組則為每千人3.7人，高危組（即40歲以下而家族成員中曾有乳癌病例）達每千人58.5人。微癌偵測率為每千人2.2人，在有病理學資料的癌症病例中佔45%，這類癌症中有28%屬乳腺導管原位癌。只作追加觀察的回診率為4.6%，只作超聲波檢查的為3.3%，兩者兼施的為2.3%。不正常乳腺X射線影像和切片活檢的正預測值分別為4.9%和26.0%。

結論 乳腺X射線影像篩檢在西方國家據報能減低死亡率達35%，然而，亞洲華人在這方面的數據卻相當貧乏。在香港，東華三院婦女健康普查部開創了大規模的自發性乳房檢查服務。雖然亞洲華人患乳癌少於西方人，本地的篩檢計劃不但成績可與西方國家的媲美，而且正在不斷改善。本地的篩檢服務甚至能替自發要求檢查的婦女檢測到早期乳癌，不但有利於預後，並且使治療方法的選擇比較多，而社會對篩檢亦非常接受。同時，篩檢計劃也為乳腺放射學和乳腺X射線成像術培訓人才，累積專業知識，為普查打下必要的基礎。

Bilateral mammography was performed by our experienced staff. Routine two-view (mediolateral oblique and craniocaudal) mammograms were obtained. Once processed, the films were read by the mammographers as first reader. If they detected suspicious findings, additional views such as cone compression or magnification views were taken before the patient left the clinic. The mammographers then completed a report for each woman, and documented any important information to aid the reporting radiologists. Such information included any presence of a palpable lump, skin lesion, scar, nipple scaling, or nipple discharge during mammography. A red sticker was placed on the envelope of such a mammogram, so as to alert the radiologist reading the films.

Dedicated specialist radiologists in Kwong Wah

TABLE 1. Number of women attending for mammographic screening and the number of cancers detected in our centre during the inclusive period 1998 to 2002

Age-group (years)	No. of mammograms performed	No. of cancers detected	Cancer detection rate per 1000 (95% CI)
35-39	188	11	58.5 (25.0-92.0)
40-44	6 678	62	9.3 (7.1-11.5)
45-49	15 516	69	4.4 (3.5-5.3)
50-54	13 301	47	3.5 (2.6-4.4)
55-59	6 559	22	3.4 (2.0-4.8)
60-64	2 304	11	4.8 (2.0-7.6)
≥65	2 091	10	4.8 (1.9-7.7)
Total	**46 637**	**232**	**5.0 (4.4-5.6)**

TABLE 2. Number of women with clinically palpable and clinically occult breast cancers detected according to pathological tumour size

Tumour pathology and size	No. of patients		
	Clinically palpable	Clinically occult	Subtotal
Ductal carcinoma in situ	11	44	55 (28%)
Invasive component <1 cm	9	24	33 (17%)
Invasive component 1-1.5 cm	10	13	23 (12%)
Invasive component >1.5-2 cm	20	16	36 (18%)
Invasive component >2 cm	20	28	48 (25%)
Total			**195**

Hospital (the second readers) then scrutinised all the mammogram films. Recall for additional views or supplementary ultrasound scan might be requested if the mammogram showed abnormality or the woman had a clinically palpable mass. The mammograms were graded according to the NHS Breast Screening Programme grading system from R1 to R5 (R1-normal/definitely benign; R2-probably benign; R3-indeterminate; R4-probably malignant; R5-malignant).[19]

There were weekly multidisciplinary mammogram meetings where breast radiologists, breast surgeons, clinicians from the Well Women Clinics and mammographers jointly reviewed mammograms rated R2 or higher and discussed the management plan of patients with abnormal mammograms. The management options included referral for surgical assessment, recall for additional views, early follow-up or biopsy—usually performed percutaneously (fine needle aspiration, core biopsy, or vacuum-assisted breast biopsy), or rarely as an excisional open surgical biopsy. Also there were monthly clinical-pathological conferences where our breast pathologist would join the discussion on the results of breast biopsy. All screening detected abnormalities referred for biopsy (stereotactic or ultrasound guided) were performed in Kwong Wah Hospital and the pathology results recorded in our database. Women with palpable abnormalities regardless of the mammogram findings were referred to the breast clinic for assessment by breast surgeons. The remaining patients (with no mammographic abnormality or palpable breast mass) were discharged to routine screening at 2-year intervals.

Our study period was from 1 January 1998 to 31 December 2002 inclusive. Any patient with symptoms of a breast lump or bloody nipple discharge was excluded from this study. Women with non-specific lumpiness or mastalgia were considered asymptomatic. All patients with screening-detected breast cancers were traced and the corresponding mammograms, clinical notes, and pathology reports were reviewed.

Results

During the 5-year study period 1998 to 2002 inclusive, 31 378 asymptomatic women attended the Well Women Clinics and a total of 46 637 mammograms were performed. A total of 14% of the women were aged 40 to 44 years; 33% were aged 45 to 49 years, and 52% were aged 50 years or above. There were 188 women younger than age 40 years with a positive family history of breast cancer who attended for mammogram screening; they constituted 0.4% of the total attendance (Table 1).

Of 46 637 screening mammograms performed during the study, we detected 232 cancers, which gave a crude cancer detection rate 5.0 per 1000 (Table 1). The age range of the women detected with cancers was 35 to 72 years with a median age of 49 years. Our cancer detection rate was 5.9 per 1000 in the age-group 40 to 49 years and 3.7 per 1000 in the age-group 50 years or above. In our study, there was a particularly high cancer detection rate of 58.5 per 1000 in the high-risk group aged younger than 40 years with a positive family history of a first-degree relative having breast cancer.

Pathology reports from 195 of these 232 screening-detected cancer patients were available for review. Minimal cancers, defined as invasive and measuring ≤1 cm or ductal carcinoma in situ, were found in 88 (45%) of the 195 cancers whose pathology was available to us. Ductal carcinoma in situ constituted 28% (55/195) of all such cancers. Whilst 57% of such cancers were less than 1.5 cm in size, the vast majority (75%) were T1 or <2 cm cancers (Table 2) and node positivity was identified in 54 (28%) of these patients. Assuming a 45% minimal cancer rate for all 232 screen detected cancers, the minimal cancer detection rate was 2.2 per 1000 screenings (232 x 0.45/46 637).

Palpable masses were detected by clinicians in the Well Women Clinics in 83 of these asymptomatic cancer patients, representing 36% of all screen-detected cancers. Fifteen of the 83 patients with palpable abnormalities (amounting to 18%) had negative mammograms and thus 6.5% of all the screen-detected cancers were mammographically occult. The larger the tumour size, the higher the proportion of cancers that were clinically palpable (Table 2).

The majority (72%) of the cancers were detected from the prevalent (first) screen while overall 3.5 per 1000 cancers were detected by incident (second and subsequent) screen (Table 3). We encountered two cases of interval cancers (ie breast cancers that presented and were diagnosed between screening rounds and not detectable by the screening programme) during the study period.

Ductal carcinoma (either invasive or in-situ) represented 92% (180/195) of all cancers whose pathology was available to us and 94% if cancers of mixed pathology were also included. Other cancer types were very rare and included lobular carcinoma, tubular carcinoma, mucinous carcinoma, papillary carcinoma, and malignant phyllodes tumour (Table 4).

Recall for additional views was requested in 4.6% of the screened population. Recall rate for supplementary ultrasound study was 3.3% and for both additional view and ultrasound study was 2.3%. Thus, the overall recall rate was about 10%.

Diagnostic interventions were undertaken in 893 women; the majority were performed percutaneously. Stereotactic core biopsy or fine needle aspiration (FNA) was undertaken on 361 (40%) of these patients. Ultrasound-guided FNA or core biopsy was performed on 401 patients. In 2000, a prone stereotactic breast biopsy table (Lorad, Danbury, Connecticut, US) and mammotome machine (Biopsys; Ethicon Endo-Surgery, Cincinnati, Ohio, US) were installed in Kwong Wah Hospital. Since then, 34 stereotactic mammotome biopsies and 25 ultrasound-guided mammotome biopsies were performed during the study period. Diagnostic excisional biopsies with hookwire localisation of the mammographically detected lesions were performed in 71 women, and ultrasound-guided localisation of a mammographically occult lesion was performed in one woman. Most of the excisional biopsies were carried out in 1998 and 1999.

The positive predictive value (PPV) based on abnormal mammograms was 4.9% and the PPV based on biopsy was 26.0%.

TABLE 3. Number of cancers detected according to the screening round*

Screening round	No. of women attended	No. of cancers detected	Cancer detection rate per 1000 (95% CI)
First (prevalent screen)	29 028	168	5.8 (5.2-6.4)
Second	11 236	44	3.9 (2.8-5.0)
Third	4 772	10	2.1 (0.9-3.3)
Fourth	1 388	7	5.0 (1.3-8.7)
Fifth or higher	213	1	4.7†

* Two patients with interval cancer were excluded

† No. of cancers detected too small for calculating confidence interval

TABLE 4. Pathology of screening-detected cancers

Pathology	No.
Ductal carcinoma (invasive or in-situ)	180
Lobular carcinoma	4
Mucinous carcinoma	3
Lobular and ductal carcinoma	2
Papillary carcinoma	2
Tubular carcinoma	1
Tubulolobular carcinoma	1
Mucinous and ductal carcinoma	1
Malignant phyllodes	1

Discussion

More and more evidence from high-quality randomised controlled trials and service population screening have shown the benefits of mammography, based on reports of significant reductions in mortality.[3-17] Currently, though there is no population screening in Hong Kong, opportunistic breast screening has been playing an important role. Such screening, which aims at detecting cancers, is not widespread in Hong Kong, so the operation of such programmes depends on individual centres. Women attending for screening on a voluntary, self-referral basis must bear the initial costs of the visit themselves. By contrast, in population screening the majority of the costs are funded by governments, or alternative co-payment methods (as in Singapore). There are no standardised quality assurance or audit programmes for opportunistic screening; individual centres establish their own standards and quality controls. Testing the acceptance of the screening method is another important role of opportunistic screening; its popularity could be used to gauge public acceptance. Such screening usually precedes or constitutes the initial step in the establishment of population screening and the Well Women Clinics of Kwong Wah and Tung Wah Eastern hospitals are benchmark examples in Hong Kong.

A successful screening programme should not only be accepted by the population but should also effectively detect cancers at an early stage, when the prognosis is favourable and the availability of treatment options with less morbidity can be offered. The strong association between advanced breast cancer and subsequent mortality, emphasises the need for early detection to prevent progression to more advanced stages.[20]

Regular quality mammography screening can detect cancer at a pre-clinical stage. In our setting, we achieved a crude cancer detection rate of 5 per 1000 asymptomatic women, with a prevalent cancer detection rate of 5.8 per 1000 and incident detection rate of 3.5 per 1000. The results were promising and comparable to standards reported internationally (Table 5).[21,22]

TABLE 5. Mammographic screening in Kwong Wah Hospital compared to international standards[21,22]

	Kwong Wah Hospital, 1998-2002	International standard[21,22]
Crude cancer detection (per 1000)	5.0	2-10
Prevalent cancer detection (per 1000)	5.8	6-10
Incident cancer detection (per 1000)	3.5	2-4
Stage 0 or 1 cancer detection	75.4%	>50%
Minimal cancer detection*	45.1%	>30%
Node positivity	27.7%	<25%
Recall rate	10.2%	<10%
PPV† based on abnormal screening mammogram	4.9%	5-10%
PPV when biopsy recommended	26.0%	25-40%

* **Minimal cancer represents invasive cancer ≤1 cm or ductal carcinoma in situ**
† **PPV denotes positive predictive value**

Tumour size and nodal status are important prognostic factors for effective breast screening.[23] Cancer with an invasive component less than 1 cm (minimal cancer) is considered to indicate that nodal metastases are unlikely; more than 90% of minimal cancers have no axillary lymph node metastases, regardless of histological malignancy grade.[24] Moreover, Tabar et al[23] also demonstrated that detecting breast cancers of less than 15 mm in size conferred a 19-fold improvement in long-term outcome. Thus detecting minimal or small cancers is of utmost importance for the success of a screening programme. Notably, our very high minimal cancer detection rate of 45% and stage 0 or 1 cancer detection rate of 75%, was much higher than the generally considered desirable goals (>30% and >50% respectively) achieved internationally (Table 5).

Fisher et al[25] demonstrated considerably more favourable outcomes in patients who were axillary lymph node negative as opposed to positive, regardless of the therapy given. This reaffirms the value of detecting and treating cancer at an earlier phase. In our centre, the node positivity rate was 28%, which was comparable to reports by others (Table 5). Among our node-positive patients, 44 (80%) of the 55 had a primary tumour of ≥15 mm in size, which reinforces the need to find smaller breast cancers so as to reduce the node positivity rate.

Clinical breast examination performed by our dedicated clinicians in the Well Women Clinics detected 36% of the cancers during the study period. Such an impressive clinical detection rate can be attributed to the combined effects of smaller breasts in Oriental women as well as the experience and expertise of our staff. Table 2 indicates that clinical breast examination is more sensitive for larger tumours; 48% versus 27% for those >15 mm versus ≤15 mm, respectively. Thus, clinical breast examination cannot be used as the sole screening method. Barton et al[26] in their meta-analysis showed that clinical breast examination only had about 54% sensitivity. However, there is evidence that it can detect some cancers not detected by mammography.[3] This was also true in our study—15 patients (accounting for 6.5% of all detected cancers) had palpable abnormalities but negative mammograms. Thus, in combination with mammography, clinical examination surely increases the sensitivity of the screening programme. It is also surmised that clinical examination is especially useful if those being screened have dense breasts, which appears to be the case in Oriental women. Moreover, about 48% of women attending our mammogram screening service were aged 40 to 49 years and being relatively young, they had less involuted (denser) breasts.

Besides, clinical examination also offered a chance for communication, facilitating explanation of the benefits and limitations of breast cancer screening and answering the women's worries.

Double reading increases cancer detection rates by 5 to 15%[27-30] and those detected by a second reader are usually at an earlier stage.[28] We adopted a double reading system on all screening mammograms; our experienced mammographers being the first readers. If the latter noted microcalcifications, suspicious masses, asymmetric densities, or architectural distortions, they would take additional views (cone compression or magnification) before the women left the clinic. These additional films alerted the reporting radiologists and aided diagnosis. Thus, the system we used helped to reduce the recall rate, keeping it at the upper limit of those reported internationally, despite the breasts of our Oriental women being denser than those of Occidentals.

It is understood that recall for additional views or ultrasound could heighten anxiety caused by the screening process itself, and add a financial burden to the programme. A number of matched prospective studies have shown that the anxiety tended to be transient[31,32] and Schwartz et al[33] suggested that women had a high tolerance for false positive results. This might partly be related to the expected benefits of mammography and explanations about why recall procedures were necessary for the early detection of breast cancer. In our centre, various additional measures to reduce anxiety included welcoming telephone enquiries from those who had undergone screening, and facilitated face-to-face consultations with our nurses or clinicians for women who had persisting concerns. In our study moreover, the favourable PPV of nearly 5% for abnormal mammograms minimised unnecessary recall (Table 5), which was consistent with our having the expertise to identify subjects having high chance of malignancy whilst minimising unnecessary recall and biopsies.

Compared to our previous performance (Table 6), currently our crude cancer detection rate, ability to detect cancer early, and cancer detection in the high-risk group were all considerably better. This trend could

be attributed to: improved equipment, better quality mammograms, and more importantly the learning curve of our radiologists and mammographers. Interpretation of screening mammograms requires dedicated training and regular audits. Throughout the years, our staff attended a number of international and local training courses or secondments and participated in many internal audits and quality assurance projects. The high workload in our centre was also an advantage for the training of our radiologists and mammographers. The value of joint mammogram meetings and clinico-pathological conferences also played an important role in enhancing communication and feedback between team members.

The age distribution of the screened population had also changed from that in the earlier study. In 1993 to 1995, the majority (45%) of attendees were 40 to 45 years old, 28% were aged 45 to 49 years, and 22% were 50 years or older. However, in 1998 to 2002, the screened population was older; 14% were aged 40 to 44 years, 33% were 45 to 49 years old and 52% were 50 years or older. This was probably a reflection of improved breast cancer awareness among older age-groups as well as higher compliance for continuing incident screening.

A screening programme is deemed to fail if the population does not consent to the screening method. One of the important objectives of self-referred screening is to test the market (acceptance of the screening method by the general population). The steadily increasing number of women attending our Clinics every year attests to the popularity of our service. In 1998, 8119 women underwent mammographic screening and rose to 10 887 in 2002, indicating a 34% rise over 4 years. Moreover, the average waiting time for women to have their first screen in our Clinics was about 2 years. Not surprisingly, some started booking their first screening mammogram at the age of 38 years, so as to be screened when they reached 40 years. The favourable uptake of our programme was also evident from our very low default rate. Finally, during the SARS (severe acute respiratory syndrome) epidemic in 2003, the attendance rate of our Well Women Clinics only dropped by about 10%, whilst the attendance rate of other clinics in our hospital had dropped by about 80%. For all these reasons we infer that our mammography screening service is well accepted by the population in our localities.

Notwithstanding the promising results achieved by our screening centre as well as support from the community, there were several limitations to our opportunistic screening programme. Unlike population screening that has recourse to organised data collection and auditing systems, opportunistic screening has limited access to data that is outside the screening centre. Patients have free choice to seek second opinions or to have biopsies or definitive operations in other hospitals. Consequently, we were unable to retrieve some operation and pathology records, resulting in incomplete data for auditing purpose; out of a total 232 cancer patients we could only review 195 (84%) of the pathology reports. In addition, there was a limitation of resources for managing the huge quantity of data we generated. Furthermore, self-referred screening invariably attracts more health-conscious women and thus represents a selected population. For these reasons, it is not intended that these results be generalised, as might be possible for population screening.

TABLE 6. Statistics of the mammogram screening services in Kwong Wah Hospital during pilot study (1991-1992), early phase (1993-1995),[18] and current study (1998-2002)

	Pilot study,* 1991-1992	Early study,[18] 1993-1995	Current study, 1998-2002
No. of screening mammograms performed	3829	8504	46 637
Crude cancer detection rates			
Age <40 years	0	2.9/1000	58.5/1000†
Age 40-49 years	2.0/1000	4.6/1000	5.9/1000
Age ≥50 years	0.8/1000	6.5/1000	3.7/1000
Stage 0 or stage 1 cancer detection rate	1.0/1000	2.8/1000	3.8/1000

* **Results of internal audit**
† **11 of 188 high-risk patients**

The success of our screening programme was the joint effort of our team, consisting of dedicated breast radiologists, experienced mammographers, dedicated clinicians in the Well Women Clinics, specialist breast surgeons, and experienced breast pathologists. The team also included support staff involved in tracing and following up screening results, for the purpose of audit.

Conclusion

Because of the lower incidence of breast cancers in Hong Kong than in Occidental populations, it has been speculated that the uptake and value of mammography screening would fall far short of expectations in western countries. However, in our setting, this does not appear to be so. Moreover, we have achieved improved performance over time, very likely due to increasing experience, maturation of the screening system and improved teamwork; audit of our own practice being the key. To cope with increasing breast cancer incidence and heightened public health awareness, there is an ever-increasing demand for quality breast screening. Our screening programme has been playing an important role not only in detecting cancers, but more importantly in detecting early cancers, which can confer a better prognosis due to the feasibility of treatments with less morbidity. Our experience also confirms that screening of high-risk women is definitely warranted. The popularity of our screening programme suggests that it is well-accepted and could constitute a role model for

breast cancer screening in Hong Kong. Our centre can also provide training and expertise for others wishing to participate in such programmes, especially breast radiologists and mammographers. Our Well Women Clinics can also play an important role in providing relevant health education in the community. All these are essential prerequisites for the introduction of population screening.

Acknowledgements

We would like to express our sincere thanks to Ms Daisy Siu, Senior Radiographer, Department of Radiology, Kwong Wah Hospital; Ms Ada Hui, Clinical Manager, Well Women Clinic; and Ms Mandy Wu, Personal Secretary, Department of Radiology, Kwong Wah Hospital, for their excellent work in helping the production of this paper.

References

1. IARC handbooks of cancer prevention—Volume 7: Breast cancer screening. France: International Agency for Research on Cancer, IARC Press; 2002.
2. Hong Kong Cancer Stat 2002. Version 1. Hong Kong: Hong Kong Cancer Registry, Hospital Authority; 2005.
3. Shapiro S, Venet W, Strax P, Venet L. Periodic screening for breast cancer: the health insurance plan project and its sequelae, 1963-1986. Baltimore: John Hopkins University Press; 1988.
4. Andersson I, Aspegren K, Janzon L, et al. Mammographic screening and mortality from breast cancer: the Malmö mammographic screening trial. BMJ 1988;297:943-8.
5. Nystrom L, Rutqvist LE, Wall S, et al. Breast cancer screening with mammography: overview of Swedish randomised trials. Lancet 1993;341:973-8.
6. Tabar L, Fagerberg CJ, Gad A, et al. Reduction in mortality from breast cancer after mass screening with mammography. Randomised trial from the Breast Cancer Screening Working Group of the Swedish National Board of Health and Welfare. Lancet 1985;1:829-32.
7. Roberts MM, Alexander FE, Anderson TJ, et al. Edinburgh trial of screening for breast cancer: mortality at seven years. Lancet 1990;335:241-6.
8. Frisell J, Eklund G, Hellström L, Lidbrink E, Rutqvist LE, Somell A. Randomized study of mammography screening—preliminary report on mortality in the Stockholm trial. Breast Cancer Res Treat 1991;18:49-56.
9. Bjurstam N, Bjorneld L, Duffy SW, et al. The Gothenburg breast screening trial: first results on mortality, incidence, and mode of detection for women ages 39-49 years at randomization. Cancer 1997;80:2091-9.
10. Miller AB, Baines CI, To T, Wall C. Canadian National Breast Screening Study: 1. Breast cancer detection and death rates among women aged 40 to 49 years. CMAJ 1992;147:1459-76.
11. Miller AB, Baines CI, To T, Wall C. Canadian National Breast Screening Study: 2. Breast cancer detection and death rates among women aged 50 to 59 years. CMAJ 1992;147:1477-88.
12. Garne JP, Aspegren K, Balldin G, Ranstam J. Increasing incidence of and declining mortality from breast carcinoma. Trends in Malmö, Sweden, 1961-1992. Cancer 1997;79:69-74.
13. Tabar L, Yen MF, Vitak B, Chen HH, Smith RA, Duffy SW. Mammography service screening and mortality in breast cancer patients: 20-year follow-up before and after introduction of screening. Lancet 2003;361:1405-10.
14. Blanks RG, Moss SM, McGahan CE, Quinn MJ, Babb PJ. Effect of NHS breast screening programme on mortality from breast cancer in England and Wales, 1990-8: comparison of observed with predicted mortality. BMJ 2000;321:665-9.
15. Jonsson H, Nystrom L, Tornberg S, Lenner P. Service screening with mammography of women aged 50-69 years in Sweden: effects on mortality from breast cancer. J Med Screen 2001;8:152-60.
16. Paci E, Duffy SW, Giorgi D, et al. Quantification of the effect of mammographic screening on fatal breast cancers: The Florence Programme 1990-96. Br J Cancer 2002;87:65-9.
17. Duffy SW, Tabar L, Chen HH, et al. The impact of organized mammography service screening on breast carcinoma mortality in seven Swedish counties. Cancer 2002;95:458-69.
18. Chan LK, Lam HS, Chan ES, et al. Mammogram screening of Chinese women in Kwong Wah Hosptial, Hong Kong. Australas Radiol 1998;42:6-9.
19. Clinical guidelines for breast cancer screening assessment. NHSBSP Publication No 49 April 2001. NHS website: www.cancerscreening.nhs.uk/breastscreen/publications/nhsbsp49.pdf. Accessed 13 Oct 2006.
20. Tabar L, Vitak B, Chen HH, Prevost TC, Duffy SW. Update of the Swedish Two-County Trial of breast cancer screening: histologic grade-specific and age-specific results. Swiss Surg 1999;5:199-204.
21. BI-RADS®—Mammography. 4th ed. Reston VA: American College of Radiology; 2003:234.
22. Bassett LW, Hendrick RE, Bassford TL, et al. Quality determinants of mammography. Clinical Practice Guideline No. 13. AHCPR Publication No. 95-0632. Rockville, MD: Agency for Health Care Policy and Research, Public Health Service, U.S. Department of Health and Human Services; 1994:83.
23. Tabar L, Tot T, Dean PB. Breast cancer: the art and science of early detection with mammography. Perception, interpretation, histopathologic correlation. Germany: Thieme; 2004:174-7.
24. Tabar L, Duffy SW, Vitak B, Chen HH, Prevost TC. The natural history of breast carcinoma: what have we learned from screening? Cancer 1999;86:449-62.
25. Fisher B, Jeong JH, Anderson S, Bryant J, Fisher ER, Wolmark N. Twenty-five-year follow-up of a randomized trial comparing radical mastectomy, total mastectomy, and

total mastectomy followed by irradiation. N Engl J Med 2002;347:567-75.
26. Barton MB, Harris R, Fletcher SW. The rational clinical examination. Does this patient have breast cancer? The screening clinical breast examination: should it be done? How? JAMA 1999;282:1270-80.
27. Ciatto S, Del Turco MR, Morrone D, et al. Independent double reading of screening mammograms. J Med Screen 1995;2:99-101.
28. Thurfjell EL, Lernevall KA, Taube AA. Benefit of independent double reading in a population-based mammography screening program. Radiology 1994;191:241-4.
29. Beam CA, Sullivan DC, Layde PM. Effect of human variability on independent double reading in screening mammography. Acad Radiol 1996;3:891-7.
30. Anttinen I, Pamilo M, Soiva M, Roiha M. Double reading of mammography screening films—one radiologist or two? Clin Radiol 1993;48:414-21.
31. Lowe JB, Balanda KP, Del Mar C, Hawes E. Psychological distress in women with abnormal findings in mass mammography screening. Cancer 1999;85:1114-8.
32. Ekeberg O, Skjauff H, Karesen R. Screening for breast cancer is associated with a low degree of psychological distress. Breast 2001;10:20-4.
33. Schwartz LM, Woloshin S, Sox HC, Fischhoff B, Welch HG. US women's attitudes to false positive mammography results and detection of ductal carcinoma in situ: cross sectional survey. BMJ 2000;320:1635-40.