Breast cancer early diagnosis experience in Florence: can a self referral policy achieve the results of service screening?

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Abstract

Study objective – To assess the impact of a breast clinic on a specific target population and evaluate early diagnosis performance indicators for breast cancer in the presence of a self referral policy.

Design – Women living in Florence between 1980 and 1989 who had undergone mammography at a self referral breast clinic were studied. Main outcome measures were the use of mammography in relation to age, symptoms, and the interval between two subsequent tests, and early diagnosis performance indicators were the detection rate (DR), the prevalence/incidence ratio, and the proportion of early detected cancers. Performance indicators were compared with those from formal screening programmes.

Setting – Florence, Italy.

Patients – All mammograms performed at the clinic from 1980–89 in 40–69 year old women living in Florence were examined (n = 42 226). Records included the date of birth and of the examination, the reason for testing (asymptomatic/presence of pain/presence of symptoms other than pain), and the TNM classification for breast cancer cases.

Main results – The total number of mammograms performed per annum increased by 70% over the decade, but much of this was routine repeat mammography (54·1% in 1989). Rates of first examinations in asymptomatic women increased in the second half of the decade from 17 per 1000 in 1985 to 31 per 1000 in 1989. Mammographic coverage decreased with increasing age from 12·6% in 40–49 year olds to 6·0% in 60–69 years old. Performance indicators of the activity in asymptomatic women were comparable with those expected in service screening. The proportion of not advanced cancers detected in asymptomatic women was 62·3% with a DR of 5·3 per 1000, and the average prevalence/incidence ratio was 2·9.

Conclusions – High quality mammography performed in a breast clinic in self referred asymptomatic women can achieve as good results as a formal invitation screening service. Only a few of these women will benefit, but those who do are likely to be younger (40–49 year old women).

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Breast cancer is still the most common cancer in women in Italy,[1] and early detection is still considered the best way of reducing its impact on women's health.[2] In Florence, the Centre for the Study and Prevention of Cancer (CSPO), which opened in 1970, has a major interest in the early diagnosis and screening of breast cancer. Since it opened the centre has provided a screening programme for 35 000 women resident in 23 municipalities of the province. An evaluation of the efficacy[3] and performance of this screening programme has already been published.[4]

The CSPO is a well established facility of the Tuscan Region Health Service in Florence, and most breast cancers in women resident in the area are diagnosed here. Moreover, almost 90% of mammograms for women resident in the city are performed at the centre.[5] Access to the centre is free of charge. Women resident in the city of Florence may present as self referrals without symptoms, for the assessment of breast symptoms (usually referred by general practitioners), or for periodic check up after a breast cancer.

Until 1989 all women with a negative test result were usually advised to have a repeat mammography every two years. Between 1980 and 1989, the activity of the CSPO evolved from providing a predominantly diagnostic service in symptomatic women to a self referral, early diagnosis service for asymptomatic women.

There are two points of specific interest in this paper. Firstly, it assesses the impact of a breast clinic with reference to a specific target population (the city of Florence), that is, the influence of the presence of this activity on women's use of mammography for the prevention of breast cancer. Secondly, it evaluates early diagnosis performance indicators in the presence of a self referral policy, and compares these results with the expected performance indicators when a public health breast cancer screening programme is carried out.[6]

The data presented are the background of the new Public Health Breast Cancer Screening Programme in the City of Florence which started in 1990 and which is currently inviting 50–69 year old women for biennial mammography.[7]

Methods

The targeted populations in Florence were 239 665 women in 1981 falling to 218 538 in 1989. The proportions of the population of women aged between 40 and 69 years were 40·3% and 42·7% respectively.

City registry and clinical data on women resident in Florence, born between 1 January 1905 and 31 December 1949, who had undergone one or more mammographies between 1980 and 1989 were collected. Women who were being followed up for breast cancer were excluded.

The following information was available:
(1) Date of birth;
(2) Reason for testing—indicated as "type of symptoms" (a) asymptomatic, (b) presence of pain, and (c) presence of symptoms other than pain;
(3) Diagnostic investigations;
(4) Cancer detection.

The women were grouped according to their age at mammography and whether they were having first or subsequent tests. This report focusses on women aged 40–69 years at the time of mammography. Cytological examinations for the period 1985–89 were also evaluated.

The date of case detection and the clinicopathological TNM classification[8] were available from the CSPO computer archives. In situ carcinomas and invasive cancers <2 cm without nodal involvement were considered "not advanced" cancers.[9] Current published reports suggest that the "cut off" size that relates best to prognosis is 1·5 cm,[10] but we could not use this measure because our cancer cases are recorded according to the TNM classification,[8] where the cut off sizes are 1 cm and 2 cm.

Rates of mammographic utilisation for resident women were assessed using a linkage programme between the CSPO archives and that of the city registry. Two population estimates were used—the 1980–84 and 1985–89 averages.

Population coverage was estimated by considering the last test performed on each resident woman. Women classified as "covered" were those who had had mammography in the three years up to 31 December 1989. Only tests done in asymptomatic women were included in this analysis.

Finally, some parameters of activity were calculated for first and repeated examinations in relation to symptoms and age group. These were the detection rate (the rate of identified cancers in all women who had had mammography, DR per 1000) and, for asymptomatic women, the prevalence/incidence ratio (P/I). This is a proxy estimate of the mean sojourn time in the preclinical detectable phase and is considered an indicator of anticipated diagnosis in asymptomatic women.[11]

The expected incidence in self referred women in the absence of screening for the periods 1980–84 and 1985–89 was estimated from the available incidence information.[12 13]

Results

Between 1980 and 1989, 156 146 mammograms were performed in 40–69 year old women at the CSPO: 42 226 in women resident in the city, 74 099 in residents in the rural screening area,[3] and 39 781 in women resident in other municipalities of the Province of Florence or in other provinces. Of the 42 226 mammograms performed in women resident in the city, 24 982 (59·2%) were first examinations and 17 244 (40·8%) were second or subsequent examinations. A total of 125 women in whom the reason for testing was not known, was excluded; there were no breast cancers in this group.

MAMMOGRAPHY AND POPULATION COVERAGE

The total number of mammographic examinations performed each year (fig 1) showed an increasing trend over the decade: from 2922 in 1980 to 4962 in 1989. The number of first time examinations, however, was stable. In 1989 repeat tests represented half of the total tests performed in the whole year.

With regard to first mammograms only, there is a noticeable trend according to symptoms (fig 2): the percentage of asymptomatic women was quite stable during the first five year period (45%) but after 1985 it rose, reaching 73% by the end of the decade. In this period the increment of the number of tests performed was 38% (taking 1980–84 as the baseline).

The proportion of women with pain or other symptoms decreased. However, the total number of symptomatic women was quite stable over the decade–mean (SD) 1755 (245).

Figure 3 shows the rate of first mammographic tests in women resident in the city of Florence in relation to age: while 50–59 year old women and 60–69 year old women had stable mammographic rates over the decade, women aged 40–49 years showed stable rates until 1985 (17 per 1000 in 1985; 95% confidence interval (95% CI) 15·9, 18·8 per 1000) but increasing rates thereafter up to the end of the decade (31 per 1000; 95% CI 28·9, 32·9 per 1000).

Women who had a repeat mammography were then analysed according to the interscreening interval (time elapsed between two subsequent mammographies, table 1). Some 45·7% of women had an interscreening interval of two to three years, which represents the time interval usually suggested by radiologists at the centre; 26·4% had an interval of less than two years; and 27·9% one of more than three years.
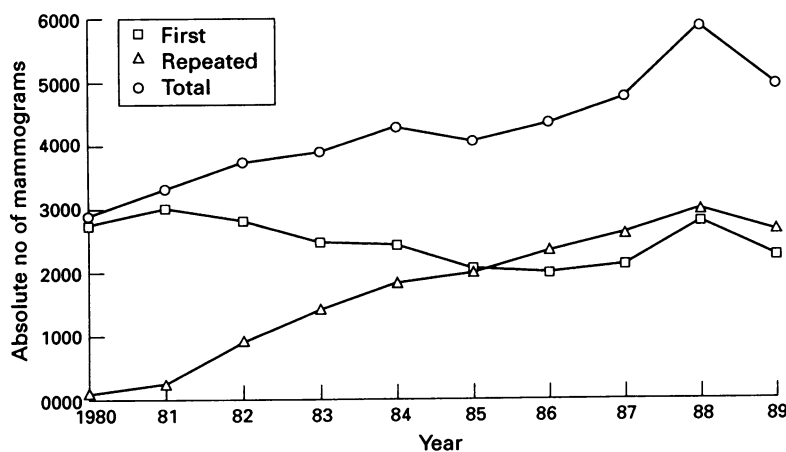

Figure 1   Absolute number of mammograms: first, repeated, and total examinations for each year during the decade 1980–89.
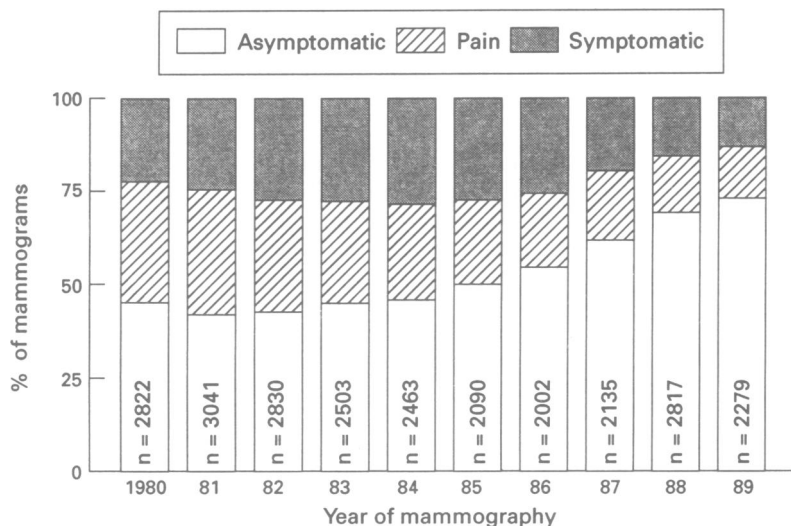
Figure 2   Number of first mammograms for each year divided according to referred symptoms (asymptomatic, presence of pain, and symptomatic women) in 1980–89.
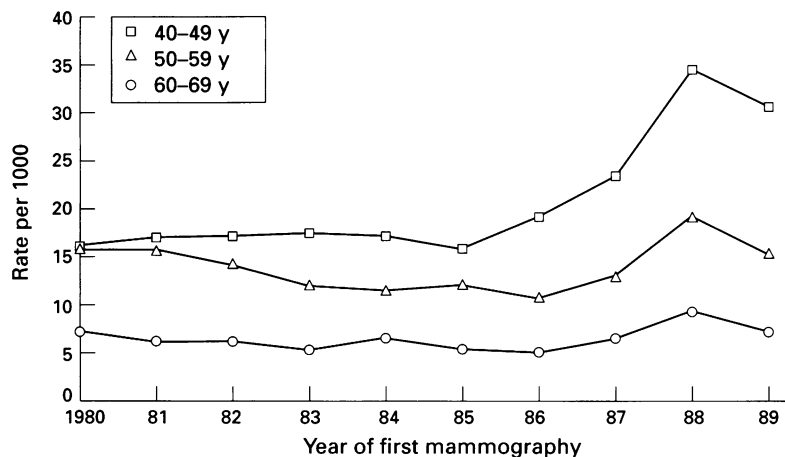

Figure 3   Rate of first mammography in asymptomatic women per 1000 residents in the city of Florence, in relation to year and age group, in 1980–89.
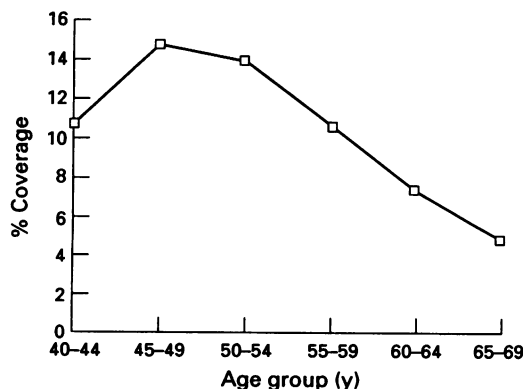

Figure 4   Mammographic coverage (%) in asymptomatic residents at 31 December 1989 who had had at least one mammography within three years in relation to age group at 1989.

The mammographic coverage in resident women was also estimated at the end of the period 1987–89. A total of 10·2% of women had had a mammogram in the past three years and 4·0% of these had been investigated because of pain or other symptoms. Figure 4 shows the coverage rates (per 100) in relation to age group and demonstrates a decreasing trend with increasing age: the values for the 40–44 years and 45–49 years age groups are 10·8% and 14·6% respectively, while the coverage decreased to 4·8% in women of 65–69 years of age.

BREAST CANCER DIAGNOSIS AND PERFORMANCE INDICATORS

In total, 1091 cases of breast cancer were detected: 906 at the first test and 185 at a repeat test. Altogether 123 were in asymptomatic women, 84 in women with breast pain, and 884 in women with other symptoms. Two cases, one with Paget's disease and a second with Phylloides Tumour, were excluded.

Table 2 presents the absolute numbers of mammographies and cancers, and the DR (per 1000) in relation to age groups, grouped according to first or repeat examinations and the reasons for referral. The average DRs (and 95% CI) for the three groups are: 5·3 per 1000 (95% CI 4·1, 6·5) for asymptomatic women; 9·5 per 1000 (95% CI 7·1, 12·0) for those who had reported pain; and 134·9 per 1000 (95% CI 125·4, 144·4) for symptomatic women, and the values increased with age. Women who reported pain showed a significantly higher DR compared with asymptomatic women. Women who underwent repeat examinations always had lower DRs. The mean values are 4·7 per 1000 in asymptomatic women, 7·3 per 1000 in the group reporting pain, and 46·6 per 1000 in women with other symptoms. In these three groups, cytology was carried out in 2·9%, 4·7%, and 27·9% of women respectively.

The distribution of breast cancer cases in relation to the clinicopathological TNM classification (first and repeat examinations) and according to the reason for referral is shown in table 3. Altogether 11·3% of cancers were excluded because a T size or nodal status, or both, were missing.

Asymptomatic women showed a higher percentage of cancers without nodal involvement: 80·3% v 60·8% ($\chi^2 = 4·28$, p = 0·038) for women with pain and 52·7% ($\chi^2 = 16·18$, p < 0·001) for other symptomatic cancers. Asymptomatic women also showed a higher proportion of "not advanced" cancers (62·3%) in respect of women with pain (41·2%, $\chi^2 = 4·16$, p = 0·041), and with other symptoms (22·7%, $\chi^2 = 43·78$, p < 0·001). At the repeat test, the correspondent values were 56·5%, 56·5%, and 29·4% respectively in asymptomatic women, those with pain, and other symptomatic women.

Table 4 shows the number of observed and expected cancers in the absence of screening and the P/I ratio (with 95% CI) for the first and repeated examinations; the average value of this ratio is 2·9 at first mammography and 2·2 at repeat mammography. A trend by age is evident.

Table 1   Asymptomatic women who had repeat mammographies during the decade 1980–89: distribution of elapsed time between two subsequent tests

Interval (y)	2nd test v 1st No	(%)	≥3rd v previous test No	(%)	Total No	(%)
0–≤1	588	(9·6)	524	(10·7)	1112	(10·1)
1–≤2	712	(11·6)	1090	(22·3)	1802	(16·3)
2–≤3	2611	(42·6)	2423	(49·5)	5034	(45·7)
3–≤4	944	(15·4)	542	(11·1)	1486	(13·5)
4–≤5	524	(8·6)	211	(4·3)	735	(6·7)
5+	744	(12·2)	101	(2·1)	845	(7·7)
Total	6123	(100)	4891	(100)	11014	(100)

Table 2   Detection rate (DR) (per 1000) at first mammography (MX) and repeat mammography between 1980 and 1989

Age group (y)	Asymptomatic women No of MX	Cancer	DR	Women with pain No of MX	Cancer	DR	Symptomatic women No of MX	Cancer	DR
DR at 1st MX:									
40–44	3775	10	2·6	1745	3	1·7	1862	102	54·8
45–49	2807	12	4·3	1287	12	9·3	1385	120	86·6
50–54	2540	9	3·5	1140	10	8·8	909	105	115.5
55–59	1989	16	8·0	975	10	10·3	690	144	208.7
60–64	1306	12	9·2	576	16	27.8	511	138	270.1
65–69	713	10	14·0	371	7	18·9	401	168	419.0
Total	13130	69	5·3	6094	58	9·5	5758	777	134·9
DR at repeat MX:									
40–44	1475	3	2·0	510	4	7·8	491	11	22·4
45–49	2710	19	7·0	891	4	4·5	698	32	45·8
50–54	2709	10	3·7	759	9	11·9	496	23	46·4
55–59	2143	5	2·3	613	4	6·5	293	22	75·1
60–64	1572	10	6·4	450	2	4·4	184	13	70.7
65–69	938	7	7·5	198	2	10·1	114	5	43·9
Total	11547	54	4·7	3421	25	7·3	2276	106	46·6

Discussion

The main aims of this study were a description of women's use of mammography for early diagnosis, and the diagnostic pattern for breast cancer in women resident in the city of Florence, where a breast cancer clinic has been operating for several years.

The population based approach allowed for a longitudinal evaluation of the diagnostic pattern and provided important background

information for the Breast Cancer Screening Programme, which started in the city of Florence in 1990. The CSPO can be considered to have covered almost all mammographic activity in Florence up to 1989, and we believe that our data give a good picture of the impact of early diagnosis on the Florence city population.

Our results show some interesting changes over time. While the total number of mammograms showed an increase of 70% over the decade and the number of first mammograms tended to fall slightly (with the exclusion of the peak observed in 1988), the workload due to repeat mammograms (that is, performed on the same woman who periodically undergoes this examination) rapidly increased.

Rates of first mammograms in asymptomatic women were quite stable up to 1984 but they increased during the second half of the decade. This finding is to be expected in view of the growing interest in and information about the early diagnosis of breast cancer. In 1987 the preparation of the new screening programme in Florence was announced and a National Congress on Cancer Screening was held.[14] With regard to age, the rates of use of mammography for early diagnosis show that younger women (under 50 years), for whom mammography has not been conclusively shown to reduce breast cancer mortality,[15] increasingly used the service. On the contrary, mammography rates in the over 50s were lower and quite stable over time.

The mammographic coverage in 1989 represents the percentage of women who can be considered as "protected" by this examination. On average, only 10·2% of the target population had a mammogram. As far as we know, there are no other Italian data on mammography in a large population, using continuously updated archives. Results from several surveys[16 17] have shown that, on average, between 9% and 15% of interviewed women had had a mammogram in the absence of symp-

Table 3   Clinicopathological TNM distribution of tumours in women who underwent mammography (MX)

TNM stage	Asymptomatic women 1st MX No (%)	Repeat MX No (%)	Women with pain 1st MX No (%)	Repeat MX No (%)	Symptomatic women 1st MX No (%)	Repeat MX No (%)
Tis	6 (9·8)	6 (13·0)	3 (5·9)	1 (4·3)	15 (2·1)	4 (4·7)
T1 N–	32 (52·5)	20 (43·5)	18 (35·3)	12 (52·2)	144 (20·6)	21 (24·7)
T1 N+	5 (8·2)	6 (13·0)	7 (13·7)	4 (17·4)	51 (7·3)	19 (22·4)
T2 N–	11 (18·0)	8 (17·4	10 (19·6)	2 (8·7)	210 (30·0)	20 (23·5)
T2 N+	5 (8·2)	4 (8·7)	11 (21·6)	4 (17·4)	183 (26·1)	12 (14·1)
T3+	2 (3·3)	2 (4·4)	2 (3·9)	— —	97 (13·9)	9 (10·6)
Total	61 (100)	46 (100)	51 (100)	23 (100)	700 (100)	85 (100)

Table 4   Observed, expected cancers, and P/I ratio (95% confidence interval) at first and repeat mammography in asymptomatic women between 1980 and 1989

Age group (y)	First mammography Observed	Expected	P/I	(95% CI)	Repeat mammography Observed	Expected	P/I	(95% CI)
40–44	10	5·15	1·9	(0·9, 3·6)	3	2·2	1·4	(0·3, 4·0)
45–54	21	9·88	2·1	(1·3, 3·2)	29	11·05	2·6	(1·8, 3·8)
55–64	28	7·09	4·0	(2·6, 5·7)	15	8·81	1·7	(1·0, 2·8)
65–69	10	1·80	5·6	(2·7, 10·2)	7	2·47	2·8	(1·1, 5·8)
Total	69	23·92	2·9	(2·2, 3·6)	54	24·54	2·2	(1·6, 2·9)

toms. Similar figures have been described in surveys in the United States.[18]

The results of our study show that the use of mammography for early diagnosis increased between 1980 and 1989, but spontaneous self referral for screening did not achieve an adequate population coverage. The proportion of women covered up to 1989, after 10 years of activity, was very low; the main impact was on younger women, and by 1989 about half of the work of the CSPO was dedicated to repeat mammography – that is to continuing women users of the facility. Data about interscreening intervals confirm this pattern. A quarter of the repeated tests were with an interval of less than two years, considered as a standard for screening. In this way an important proportion of mammographies was performed in "high user" women, a well known phenomenon in Pap smear screening. Similarly, approximately 25% of mammographies were performed with very long and perhaps less efficacious intervals.

The second point of interest in our study was to evaluate the diagnostic performance in women who self refer for early diagnosis and compare this with results expected in a screening programming according to some early indicators of process quality. The parameters and their values suggested by some authors[6 11 19] are as follows:

(1) The prevalence rate at first screening, which should be no less than three times the underlying incidence rate;

(2) The stage distribution of screen detected cancer at first test, with no more than 40% stage II disease or more advanced;

(3) Stage distribution of cancer at subsequent test, with no more than 30% stage II or more advanced.

Our results are comparable with those expected. The DR in asymptomatic women is quite similar to that obtained in a screening programme; there is also an increasing trend by age which is consistent with the increase of incidence. The P/I ratio at the first mammography is close to the suggested standard for screening programmes. Again there is an increasing trend by age, showing a better diagnostic anticipation by mammographic screening in older women. The DR and P/I ratios in repeat mammographies confirm the data in the published reports[11] showing lower values in comparison with first mammographies.

In conclusion, our study showed that in a breast clinic where a screening programme is underway and the same protocols are used for self referring asymptomatic women, high quality, early diagnosis can be achieved and the results are comparable with those expected in an organised breast cancer screening programme. Dependence on spontaneous activity – that is, dependence on women's aware-

ness and attitudes towards the use of mammography for prevention without an organised local programme – may result, however, in this type of prevention being used by a minority (and not necessarily the most appropriate minority) of women. A public service may therefore be working for a very select number of women and sometimes repeating the test within quite short interscreening intervals. Population coverage makes the real difference between the two policies and can have a major impact on the effectiveness in terms of mortality reduction. An organised breast cancer screening programme makes high coverage of the population possible, and in particular may reach those women for whom higher efficacy can be expected.

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