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Higher risk breast screening: cancer detection rates, recall rates, and attendance rates in Northern Ireland

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AIM: To evaluate the outcomes of higher risk screening in Northern Ireland (NI) and compare with the UK National Health Service Breast Screening Programme (NHSBSP).

MATERIALS AND METHODS: Higher risk breast screening commenced in NI in April 2013. Data on the programme were audited retrospectively through the Higher Risk screening centre. As there are no national standards for attendance rates and cancer detection rates, screening data and standards from the NHSBSP were used as a baseline for comparison.

RESULTS: Attendance rates for the higher risk screening population have increased each of the last 3 years up to 77.7%. Recall rates have improved year on year from initial 14.2%–8.6%. Cancer detection rates have varied each year with a range from 21.5 per 1,000 women screened to 30.9 per 1,000 women screened.

CONCLUSION: The Higher Risk Breast Screening Programme in NI represents a success story in risk stratified screening. Performance outcomes are excellent. The data outcomes may be used to inform standards of acceptable practice in the wider NHSBSP.

Introduction

Breast screening in Northern Ireland (NI) commenced in November 1989 in line with the English model of triennial mammography between the ages of 50 and 64 years with age extension to age 70 years in 2009. Data are monitored annually via the National Breast Screening System UK (NBSS). National consolidated standards apply to the NHSBSP[1]; however, there are no standards for higher risk screening.

In November 2012 the Chief Medical Officer for NI instructed the Public Health Agency (PHA) to set up a screening programme for women deemed to be at a higher risk of developing breast cancer. A working group was convened containing representatives from each of the five health trusts in NI. The working group was multidisciplinary and focussed on how best to deliver a programme within the guidance from Public Health England that best meets the needs of the women in NI.[2]

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In an effort to identify eligible women the PHA wrote to all Acute Medical Directors in the five health trusts and also to all general practitioners (GPs). A trawl of the genetics database in NI also aided identification. Good representation on the working group from each of the five health trusts aided dissemination of information to the breast cancer clinics. Referrals were invited from oncologists, geneticists, breast surgeons, and family history clinicians. A national centralised screening programme for women at higher risk of developing breast cancer commenced in NI in April 2013. Prior to this, the provision of screening for higher risk women was piecemeal across five separate symptomatic breast units.

Eligibility and risk stratification for higher risk screening follows PHE guidance.[3] Following referral to the programme, eligibility is checked by the higher risk screening lead. The woman is assigned a protocol based on age and risk category (Table 1). Screening is performed on an annual basis from the age of 30 years. Screening may involve breast magnetic resonance imaging (MRI), digital mammography, or both. There is currently no upper age limit for screening. Women who undergo bilateral mastectomy (prophylactic or therapeutic) are automatically ceased from screening and removed from the programme as per national guidance.

There are no national published standards for the Higher Risk Screening Programme. It has been suggested that national data be collected on high-risk screening to determine the acceptability of the test to women and its diagnostic performance.[4] Attendance following invitation to screening is a monitored statistic in the NHSBSP. The acceptable attendance rate is $\geq$70% for the general screening programme. It may be reasonable to apply the same standard to the higher risk group.

Recall rates in the general screening programme have an acceptable standard of $<$10% for the prevalent screen and $<$7% for the incident screen. The Association of Breast Surgery (ABS) has set a key performance indicator (KPI) recall rate standard of $<$10% for higher risk screening.[5] In women with a higher risk of developing breast cancer the recall rate could be reasonably expected to be higher than the NHSBSP.

The NHSBSP uses age standardised detection ratios (SDRs) to monitor cancer detection in the general screening programme. The same SDRs cannot be used for higher risk screening as the expected numbers of cancers (to be used as the denominator) within the eligible population screened is unknown; however, it is expected that the cancer detection rate within this population will be higher than in the general screening population. It may be reasonable to expect a cancer yield of 14.9 per thousand screened in the higher risk group.[6]

The aim of the present study was to compare outcomes of a risk-stratified screening programme to the general screening programme. Four years of data have been collected and analysed to date. The results are presented below.

Materials and methods

Four years of data on higher risk screening were audited retrospectively. Data were obtained from a local database at the screening unit where higher risk screening for NI is performed and cross referenced with data from NBSS. Data on higher risk screening in the other UK countries are incomplete on NBSS and could not be used for direct comparison. The audit project was registered with the trust and ethical approval was deemed not required.

Results

In the general screening programme, women aged 50–70 years registered with a GP in NI are invited for mammographic screening every 3 years. In 2016/17, across four screening units, 81,882 women were invited[7] with 77.1% attending screening. The recall rate for assessment was 3.9%. Cancer detection was 6.5 per 1,000 screened. These figures provide useful comparators to the higher risk programme figures, which are presented below.

In 2013–2014, 235 women were invited for higher risk screening. One hundred and sixty-two women attended giving an attendance rate of 68.9% (Fig 1). In 2014–2015, 414 women were invited for higher risk screening; however, only 259 women attended giving a reduced attendance rate of 62.6%. In 2015–2016, 446 women were invited for higher risk screening and 314 women attended giving an increased attendance rate of 70.4%. In 2016–2017, 479 women were

Table 1
Higher risk screening protocols.

Risk	Age (years)	Surveillance protocol	Frequency	Notes
BRCA1 or BRCA2 or	20–29	N/A	n/a	Review MRI annually on basis of
Not tested, equivalent high risk	30–39	MRI	Annual	background density
	40–49	MRI + Mammography	Annual	
	50+	Mammography ± MRI	Annual	
TP53 (Li-Fraumeni)	20+	MRI	Annual	No mammography
A-T homozygote	25+	MRI	Annual	No mammography
A-T heterozygote	40–49	Mammography	18 monthly	Routine screening from 50 years
	50+	Mammography	Routine screening (3 yearly)	
Supradiaphragmatic	30–39	MRI	Annual	Surveillance commences at 30 years,
radiotherapy-irradiated	40–49	MRI ± mammography	Annual	or 8 years after first irradiation, whichever
below age 30 years	50+	Mammography ± MRI	Annual	is the later. Review MRI annually on basis of background density

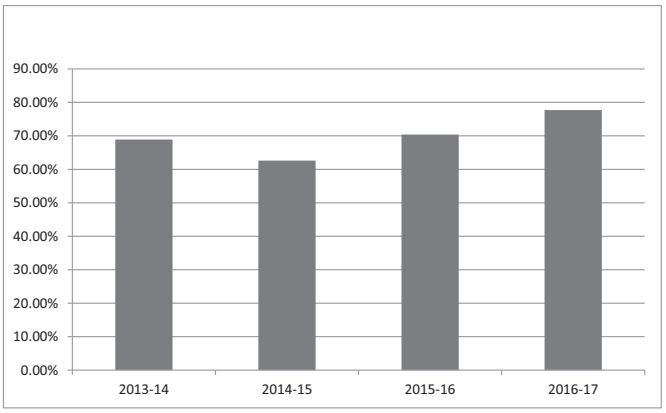

Figure 1 Attendance rate.

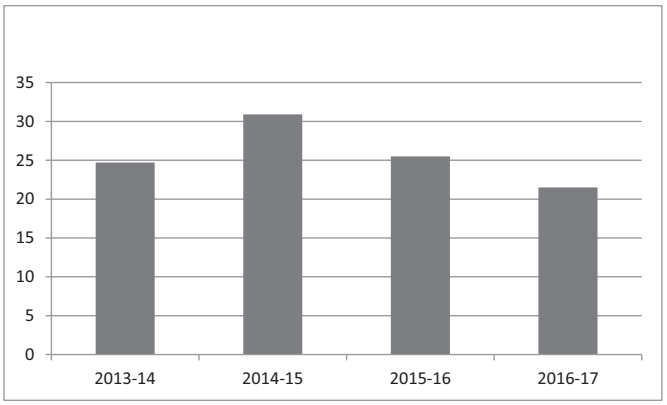

Figure 3 Cancer detection rates.

invited for higher risk screening and 372 women attended giving a further increased attendance rate of 77.7%.

Apart from the low attendance figure of 62.6% in 2014–2015, there has been a trend of increasing attendance each year. The last 2 years attendance figures have been above the acceptable threshold for the NHSBSP. In 2016–2017, the attendance rate of 77.7% is close to the achievable rate of ≥80% as published by NHSBSP. Increased awareness of the higher risk programme in NI may have contributed to increasing attendance. There has been no specific public awareness campaign in NI but increased awareness amongst clinicians involved in screening and symptomatic breast clinics along with close collaboration with BRCANI (charitable organisation) may have contributed to better awareness of the availability of higher risk screening. The improving rates suggest acceptability of screening within this population.

There has been a gradual reduction in recall rate from 14.2% in 2013–2014 to 8.6% in 2016–2017 (Fig 2). This demonstrates a clear trend of reducing recall rates over time. Factors likely to be contributing to this are increased reader experience amongst the radiologists interpreting the MRI examinations and evolution of a new screening programme with a balancing over time between prevalent and incident screens.

A total of 28 cancers were detected over the 4 screening years with a total of 1,107 screening episodes, which equates to an average cancer yield of 25.3 per thousand screens. The cancer detection rate (CDR) ranges from 21.5 to 30.9 per 1,000 screened women (Fig 3). The CDR demonstrated slight variability over 4 years, which may be expected given the relatively small numbers. It may therefore be reasonable to assume an expected CDR of >20 in this cohort, but larger numbers of screened women over a longer timeframe is required.

Screening methods were assigned according to age and breast density in line with national protocols. Out of the 28 cancers, 15 out of 15 were detected using MRI (sensitivity 100%), and 19 out of 24 were detected with mammography (sensitivity 79%; Table 2). In the group of women undergoing combined mammography and MRI surveillance, five

Table 2
Cancer detection by technique.

Screening method	Total cancers	Detected at mammography	Detected at MRI
MRI only	4	N/A	100% (4/4)
MRI + mammography	11	55% (6/11)	100% (11/11)
Mammography only	13	100% (13/13)	N/A

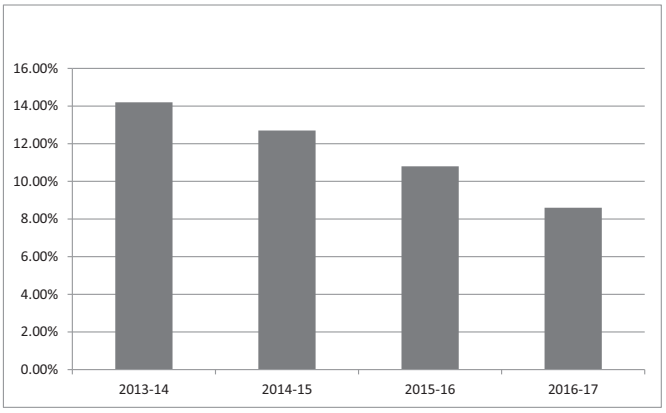

Figure 2 Recall rates.

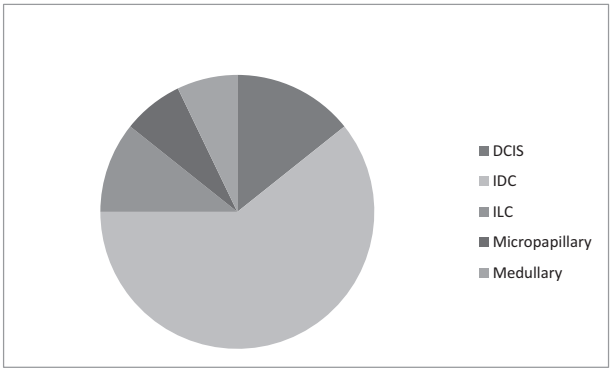

Figure 4 Types of cancer.

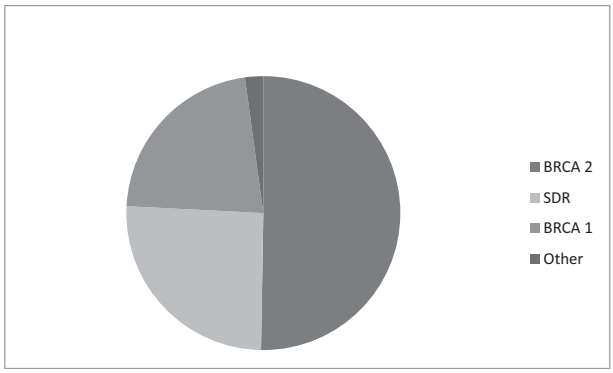

Figure 5 Risk categories.

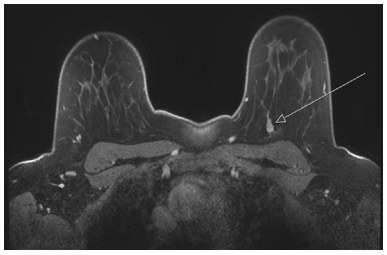

Figure 6 Case 1. Screening MRI in a 35-year-old BRCA 1 woman. T1-weighted contrast-enhanced MRI showed a 14 mm type III enhancing nodule. Left mastectomy revealed grade III medullary carcinoma.

out of 11 cancers were not visible on mammography and only seen with MRI.

Only one woman underwent MRI-guided vacuum-assisted biopsy (VAB), which was non-diagnostic, yielding a B1 result. Diagnosis was eventually made using ultrasound-guided 14 G core biopsy in that particular case. Three cancers were diagnosed with stereotactic 9 G VAB. The other 24 cancers were all diagnosed with ultrasound-guided 14 G core biopsy.

Of the 28 cancers, four were non-invasive (all high grade ductal carcinoma in situ) and 24 were invasive (17 invasive ductal carcinoma, three invasive lobular carcinoma, two invasive micropapillary carcinoma, two invasive medullary-like carcinoma; Fig 4).

The breakdown of risk categories is presented for the most recent screening year (2016–2017; Fig 5). Of 372 women screened, 50% (n=187) were BRCA 2 with 25.5% (n=95) in the supradiaphragmatic radiotherapy group, and 22% (n=82) were BRCA 1. Eight (2.2%) women were in other high-risk groups as defined by a geneticist (ataxia–telangiectasia heterozygotes, TP53, PTEN, other). Four case examples of screen-detected cancers from the higher risk screening population are presented in Figs 6–9.

Discussion

Risk-stratified screening for breast cancer is a vogue topic of discussion in the screening community. This paper presents 4 years of data since the commencement of higher risk screening in NI following PHE guidance for risk stratification. The data outcomes were compared with data from the general screening programme in NI. The inception of a new formalised screening programme in this context was very much a step into the unknown. In 2013, it was not known how many women would qualify for higher risk screening,

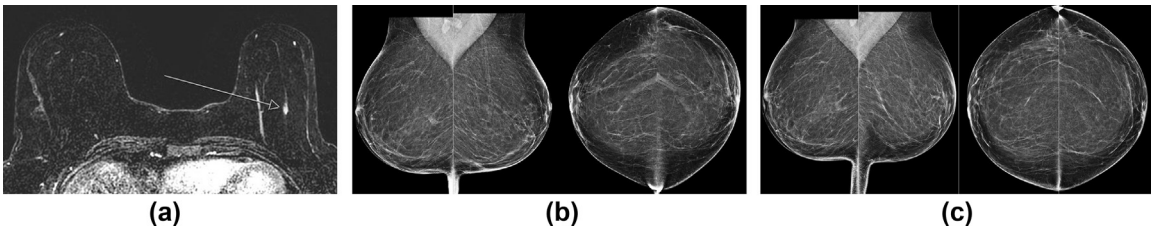

Figure 7 Case 2. (a) Screening MRI and mammography in a 41-year-old BRCA 2 woman. An 8 mm non-mass-like enhancement in the left breast at 6 o'clock can be seen on the T1-weighted, contrast-enhanced subtracted MRI image. (b) Subtle new asymmetric density in the left breast was seen on the mammography image. Mastectomy revealed a 7 mm grade II invasive ductal carcinoma. (c) A mammogram performed for the previous screening round is provided for comparison.

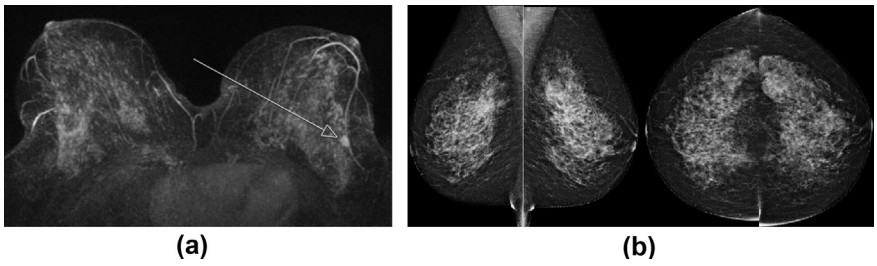

Figure 8 Case 3. Screening MRI and mammogram in a 45-year-old BRCA 2 woman. (a) Maximum intensity projection contrast-enhanced subtracted T1-weighted MRI shows a stippled background enhancement with a 10 mm type III enhancing nodule in the left lower outer quadrant. (b) Mammography demonstrates dense tissue and benign nodularity, which is essentially normal. Mastectomy revealed a 14 mm grade II invasive lobular carcinoma.

Figure 9 Case 4. Screening mammogram in a 65-year-old BRCA 2 woman. Pleomorphic calcification can be seen in the right breast at 6 o'clock. Mastectomy revealed a 38 mm high-grade ductal carcinoma in situ.

what the uptake would be, and how many cancers would be detected.

During 4 years of screening, the invited population has grown from 235 to 479 with an associated increased uptake rate currently above the accepted standard for the NHSBSP. The steady rise in attendance in the last 3 years suggests acceptance for screening in this population. With further increased awareness and educational programmes, it is thought that 80% attendance is achievable in this screening group. The NHSBSP standard for screening attendance in the general screening programme should also be applied in this higher risk group.

The number of women eligible for higher risk screening in NI has increased for each of the 4 years described in this study; however, this figure is appearing to now plateau. Clearly, as a screening programme commences, referrals will increase year on year until a steady state is met. The 2017–2018 data are incomplete and were not included in the results, but there were 447 eligible women in that cohort compared with 479 women in 2016–2017.

ABS has set a KPI recall rate of $<$10% for higher risk screening. This was achieved only in the most recent 2016–2017 data; however, recall rates show a steady decrease year on year suggesting that $<$10% is an achievable target. It is likely that the steady decrease in recall rate is in part due to increased reader experience as the screening programme has developed, but also a move from predominantly prevalent screening to more incident screening. A recall rate standard of $<$10% should be applied.

The cancer detection rate has varied year on year. This was not unexpected given the relatively small numbers attending this programme. Over the 4 years there has been a cancer yield of 25.3 per 1,000 screens and each year the figure has been $>$20 per 1,000. There is no CDR target set by PHE. An achievable target of $\geq$20 per thousand screens is suggested, but this should be based on a larger data set.

In conclusion, the Higher Risk Screening Programme in NI has been implemented successfully with increasing identification of eligible women, increasing uptake, acceptable recall rates, and high cancer yield. The data discussed may form the basis for development of targets in this screening programme. The attendance targets should remain aligned with the NHSBSP and an achievable recall rate of $<$10% should be applied, although this may prove ambitious in the initial years of commencement of such a screening programme. Cancer detection rates of $>$20 per 1,000 are achievable.

Conflict of interest

The authors declare no conflict of interest.

Acknowledgements

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