



Film reading in the East Midlands Breast Screening Programme – Are we missing opportunities for earlier diagnosis?



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AIM: To assess whether there are any significant differences in the film-reading histories of interval or screen-detected cancers, and whether this affects stage at diagnosis.

MATERIALS AND METHODS: The rates of screen-detected and interval cancers (overall and by radiological categorization) were observed from 268,067 women screened in the East Midlands Breast Screening Programme over 2004–2007 to assess whether there were differences in incidence based on previous film-reading history. Cancers detected at the subsequent screen and film-reading history were analysed to assess whether this affected stage at diagnosis. Analysis undertaken involved cancer detection rates, confidence intervals, and chi-square tests with Monte Carlo simulation.

RESULTS: Rates of interval cancers were similar in all groups where at least one reader had indicated recall to assessment (6.1–7.7/1000) and were significantly higher in comparison to women whose previous film-reading outcome was unanimous routine rescreen (2.9/1000; $p < 0.001$). Four point one percent of interval cancers with no previous recall outcomes were false negatives, which was significantly lower compared to the groups where at least one reader had indicated recall (10.9%; $p = 0.005$). Cancers detected at the subsequent screen demonstrated no significant difference in prognosis dependent on previous film-reading history ($p = 0.503$).

CONCLUSION: The prognosis of screen-detected cancers was similar and few cancers were false negatives regardless of film-reading history at the previous screen.

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Introduction

The reference standard for image reading in the National Health Service Breast Screening Programme (NHSBSP) is acknowledged as double reading with arbitration of discordant cases.^{1,2} This method encourages optimal screen-reading sensitivity and specificity to maximize the detection of screen-detected cancers whilst minimizing the

presentation of cancers arising between screens; interval cancers. The NHSBSP routinely screens all women aged 50–70 years triennially and routinely monitors rates of screen-detected and interval cancers. Formal audit is also undertaken of all cancers that arise following a previous assessment episode; either presenting later as symptomatic cancer or at the subsequent screen as a screen-detected cancer.³ These film-reading practices and audit of the programme are standard methods adopted by the quality-assurance service to monitor the ongoing performance of the programme. There is little evidence in the literature to evaluate whether there are any real differences in the film-reading history of screen-detected and interval cancers, either prospectively or retrospectively.

The aim of the present audit was to analyse the previous film-reading history of cancers arising in the East Midlands breast-screening programme to assess whether there was any significant difference between the incidence of screen-detected and interval cancers by film-reading history and whether this appeared to have any impact on prognosis. In short, are we missing opportunities for earlier diagnosis in the programme?

Materials and methods

Included in the study were 268,067 women (median age 55, range 49–86) who underwent triennial screening mammography at four programmes within the East Midlands region of the NHSBSP, either at a static specialized screening site or on a mobile facility. Screening services were included in the study where mammograms were independently double read with arbitration of discordant reads by a single radiologist recorded as the third opinion on the national database (NBSS), using the same method of film reader entry on the NBSS computer system consistently over 2004–2007. Four out of eight units were excluded as they had different protocols, which comprised arbitrating all cases where any number of recalls was indicated or arbitration opinions were entered differently into the national computer system. All women underwent two-view mammography involving mediolateral–oblique and craniocaudal views of each breast at all screens. Of the four services within the East Midlands region, two services routinely invited all women 50–70 years between 2004–2007, whereas two services screened women aged 50–64 from 2004–2005 and then expanded their services to implement the age extension (50–70 years) from 2005 onwards. Films were read by a combination of radiologists ($n = 24$) and advanced radiographic practitioners ($n = 12$). Previous films were available for comparison for all women attending an incident screen. Film reading was not completely blind and the second reader would have an indication of what had been previously recalled at all services in the study. At arbitration, the arbitrator would have access to previous opinions and conventionally, if the abnormality was not seen by the arbitrator, the previous opinions regarding site and type of abnormality were consulted for information. All services screened women with analogue mammography equipment and with direct entry of results into the NBSS.

The film-reading outcome for women screened over 2004–2007 was assessed against their screening history over the period; whether they were diagnosed as screen-detected cancers or diagnosed with cancer on a short-term recall protocol or were diagnosed symptomatically in the period between screens as an “interval cancer”. The outcomes of the same cohort of women were examined at the following screening round during 2007–2010 and if they were diagnosed with screen-detected cancer, the film-reading history from the previous screening episode was examined and compared in conjunction with various prognostic features.

Cancer detection rates, confidence intervals, and chi-square tests with Monte Carlo simulation were used to assess any differences in the film-reading history over 2004–2007.

Interval cancers were collected via downloads received by two cancer registries serving the region (Trent and Oxford Cancer Intelligence Unit) and from interval cancers identified by the host screening services to maximize ascertainment. Details of these were collected on a bespoke regional interval cancer database and data for all interval cancer cases was cross-matched with previous film-reading history on the NBSS system. This allowed comparative rates of interval cancers to be calculated based on the previous film-reading history.

All interval cancers were reviewed by radiologists at the four screening services. At least one radiologist undertook the review and where diagnostic and previous screening images were available for comparison, the previous screening mammograms were classified as follows: category 1 (normal/benign), category 2 (uncertain), and category 3 (suspicious features).³ Cross-matching the radiological categorization with the previous film-reading history allowed cohort analysis. Prognostic information was not analysed as the majority of interval cancers are acknowledged to be “true intervals”, hence not detectable at a previous screen.

The cohort of women screened over 2004–2007 were followed up at the subsequent screening round (2007–2010) and the previous film-reading history of any screen-detected cancers arising in that cohort was recorded. Rates of cancers and prognostic features were calculated based on previous film-reading history. Histopathology details of screen-detected cancers (malignant status, size, nodal status; number positive/negative, grade) were combined with previous film reporting outcomes of first, second, and arbitration reads. Analysis of comparative stage at diagnosis for each cohort of women was performed using the Nottingham Prognostic Index (NPI).⁴

Results

Of the 268,067 women screened between 2004–2007, the majority (92%) were returned to routine recall following no abnormality reported by two independent film readers. Where double reading was discordant, 13,279 (5%) women had a further arbitration read. Of those, 9726 (73%) were returned to routine rescreen, whereas 3553 (27%) were

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