The British Journal of Radiology, 85 (2012), 845–847

COMMENTARY

Breast screening review—a radiologist's perspective

M J MICHELL, FRCR

South East London Breast Screening Programme and National Training Centre, Department of Radiology, King's College Hospital, London, UK

ABSTRACT. Recently published articles in the lay press and scientific journals have questioned the value of breast screening, and have raised concerns about both possible harmful effects and the information provided for females when they receive their screening invitation. A review of data from screening trials and the process for providing information for the public on screening has been announced by Professor Sir Mike Richards, National Clinical Director for Cancer. What are the major issues involved and what expectations should radiologists and other members of the screening team have of the review?

Received 19 December 2011
Revised 29 February 2012
Accepted 20 March 2012

DOI: 10.1259/bjr/21332901

The National Breast Screening Programme was started in 1989 and fully implemented across the UK by 1995 following an analysis of the evidence available at the time [1]. The programme offers regular 3-yearly mammography from the age of 50 years for the early detection and treatment of breast cancer—in 2008/9, over 2 000 000 females were screened and 16 535 cancers were diagnosed, of which >10 000 were either small (<15 mm in diameter) invasive cancer or ductal carcinoma *in situ* (DCIS) [2]. The programme has been improved over the last 20 years through developments such as two-view mammography and the extension of the invitation age to 70 years following rigorous evaluation through research and pilot projects. Current programme developments include an evaluation of a further extension of the age range for screening—one additional screen between 47 and 50 years and one additional screen between 70 and 73 years [3], and the provision of specialised screening, including the use of MRI, for younger females with a high genetic risk of breast cancer [4]. Recently published articles in the lay press [5, 6] and scientific journals have questioned the value of breast screening [7, 8], and have raised concerns about both possible harmful effects [9–12] and the information provided for females when they receive their screening invitation [13, 14]. A review of data from screening trials and the process for providing information for the public on screening has been announced by Professor Sir Mike Richards, National Clinical Director for Cancer [15]. What are the major issues involved and what expectations should radiologists and other members of the screening team have of the review?

For all screening programmes, where a test is offered to a population of predominantly asymptomatic healthy individuals, the potential benefits must be considered in relation to the potential harmful effects to individuals and to the population as a whole. Mammography screening is effective in detecting small invasive breast cancers and cases of *in situ* carcinoma, many of which are asymptomatic. The effect of screening on decreasing premature deaths from breast cancer has been the subject of extensive study by large, carefully conducted trials carried out in Europe and North America over the past four decades. The results of these trials have been the subject of review and meta-analysis summarised in the International Agency for Research on Cancer 2002 publication [16]. Results of the trials have been updated [17–19] and, recently, long-term 30-year follow-up data from the Swedish Two County Trial have been published, showing a significant reduction in breast cancer mortality in females invited for screening (relative risk of death from breast cancer=0.69, 95% confidence interval 0.56–0.84; $p<0.0001$) [20]. There have been improvements in 1-, 5- and 10-year survival rates for females diagnosed with breast cancer in the UK over the past three decades, accompanied by a progressive decrease in the number of deaths, despite a rise in the incidence [21–23]. This improvement is likely to be due to both diagnosis at an earlier stage, through screening and earlier symptomatic presentation, and improvements in treatment by specialist teams and greater use of hormone and chemotherapy [24, 25]. Further advances in therapeutic regimes for both early and advanced breast cancer are being incorporated into recommendations for clinical practice as evidence becomes available [26]. Lower breast cancer survival rates in the UK than in other northern European countries are likely to be a result of patients having more advanced disease at diagnosis [27, 28].

The potential harmful effects of screening are related to the diagnosis and treatment of some females with cancers that perhaps might not have progressed to cause symptomatic disease—so-called ''over-diagnosis''—and the lack of specificity of mammography leading to recall for further tests for many healthy females without cancer.

The variation in the growth rate of breast cancers results in the detection of some very slow-growing tumours, for which the effect of mammography

Address correspondence to: Dr Michael Michell, Breast Radiology Department, King's College Hospital, Denmark Hill, London SE5 9RS, UK. E-mail: michael.michell@nhs.net

screening may be to bring forward the time of diagnosis without any effect on the final outcome or time of death–lead time bias.

The number of such cases of over-diagnosis has been debated extensively. The conclusion of the Advisory Committee Report of 2006 [29] was that such cases that might not have progressed to symptomatic disease amount to one-eighth of all invasive cancers detected [30, 31]. The detection and diagnosis of such cases are inevitable in screening practice because mammographic features of malignancy do not allow the screening team to reliably distinguish between low-grade indolent disease and high-grade aggressive disease—a small cluster of microcalcification may be due to an area of low-grade DCIS or may be the only sign of a grade III invasive carcinoma [32, 33]. Small, low-grade lymph node negative cancers are also diagnosed in symptomatic practice as more females present with minimal symptoms following extensive public health education campaigns. Experience from both screening and symptomatic diagnostic practice demonstrates that breast cancer is a heterogeneous disease and encompasses a spectrum of conditions with different growth rates, biological behaviour and potential for metastatic spread.

Different treatments are being developed and evaluated for the wide range of different breast cancers diagnosed—the focus should be on avoiding ''over-treatment'' rather than over-diagnosis. The screening programme has recognised the uncertainties that result, particularly with regard to choice of treatment, and has supported research and auditing in order to improve knowledge and understanding of the biological behaviour and natural history of all types of invasive cancer, *in situ* disease and borderline conditions including atypical epithelial hyperplasia and lobular neoplasia. The Sloane Project now has >7000 cases of DCIS recorded with imaging, pathology and treatment details and is currently gathering follow-up data. This is an invaluable resource that is helping to improve both the management of *in situ* breast disease and the quality of information provided to patients [34]. Further prospective studies are being considered to examine the results of conservative treatment or surveillance for females diagnosed with indolent lesions such as low-grade DCIS [35].

The difficulties of mammography interpretation and the subtle signs of many small breast cancers require specialist training and double reading to maximise cancer detection. 8.7% of females attending their first screen and 3.4% of females attending for subsequent screens are recalled for further assessment, including clinical examination, imaging and in some cases needle biopsy. In 2008/9, 2 078 195 females were screened, 91 395 (4.4%) were recalled and 16 535 (0.8%) were diagnosed with cancer. Could the programme be run more efficiently with a reduced recall rate without compromising its aim to detect and treat females with small, early-stage breast cancers? Significantly lower recall rates combined with satisfactory cancer detection rates have been achieved in some European programmes, notably in Scandinavia [17, 18]. The implementation of digital mammography not only offers the opportunity to achieve efficiencies through loss of film handling costs, but may also allow more accurate and efficient screen film reading from improved image quality and the use of advanced applications such as computer-aided diagnosis and digital breast tomosynthesis.

Apart from the direct benefit of breast screening in decreasing breast cancer deaths, the development of the programme has had a profound effect on the quality of care provided for all patients undergoing investigation for breast disease. The recognition from the outset that the highest quality was required throughout the service, supported by robust quality assurance and specialist training, has driven up the standards of breast radiology and diagnosis throughout both screening and symptomatic breast services in the UK. Image quality and the quality of reporting have been improved, and the development of accurate image-guided biopsy techniques mean that >95% of females with breast cancer should expect to have an accurate pre-operative diagnosis with information about tumour grade, type and receptor status allowing full discussion of treatment options. The strong emphasis on multidisciplinary team working is now an integral part of all cancer services, and the successful development of skill mix with advanced practitioner radiographers taking on such tasks as film reading, ultrasound and biopsy procedures has improved the flexibility and capacity of the breast diagnostic team, at a time of ever-increasing demand and limited resources.

All screening programmes have a duty to provide sufficient information to enable the individual to make an informed decision when invited for screening. The current 12-page national breast screening information leaflet sent with every invitation for screening [36] has been heavily criticised for not providing a reasonable balance of information regarding the potential benefits and harmful effects of screening, and in particular for providing insufficient detailed information regarding DCIS [37]. Production of a leaflet that contains sufficient balanced information in a form that is readable and understandable by a population with such widely varying degrees of knowledge is immensely challenging—in a previous version of the leaflet, all reference to DCIS was excluded following field testing and feedback from females of screening age. It is hoped that the review will make specific recommendations for a robust process to ensure that sufficient information is provided in a satisfactory format.

The quality of service offered by the screening programme and diagnostic breast services has been transformed during the past 20 years through research, audit, training and incorporation of new technology. Most females will continue to take advantage of the invitation to screening and the chance to detect breast cancer before symptoms appear, despite the uncertainties and potential harmful effects that this may involve. The review currently being undertaken provides an opportunity to further improve the effectiveness and efficiency of the programme, and to ensure that the public are fully engaged and informed about the benefits, risks and limitations of screening.

References

1. Forrest P. Department of Health and Social Security. Breast cancer screening, Report to the Health Ministers of

England, Wales, Scotland and Northern Ireland. London, UK: Her Majesty's Stationery Office; 1986.
2. Patnick J. NHS Cancer Screening Programmes. NHS Breast Screening Programme Annual Review 2010, Overcoming Barriers. Sheffield, UK; 2010.
3. Moser K, Sellars S, Wheaton M, Cooke J, Duncan A, Maxwell A, et al. Extending the age range for breast screening in England: pilot study to assess the feasibility and acceptability of randomization. J Med Screen 2011;18:96–102.
4. Department of Health. Cancer reform strategy. London, UK; 2007.
5. Smyth C. Women in breast cancer dilemma as experts disagree over screening. The Times. 26 October 2011, pp. 8–9.
6. Boseley S. NHS breast screening is leading to needless treatment, say scientists. The Guardian. 12 October 2011. Available from: http://www.guardian.co.uk/society/2011/oct/12/nhs-breast-screening-treatment?INTCMP=SRCH
7. McPherson K. Should we screen for breast cancer? BMJ 2010;341:233–5.
8. Autier P, Boniol M, Gavin A, Vatten LJ. Breast cancer mortality in neighbouring European countries with different levels of screening but similar access to treatment: trend analysis of WHO mortality database. BMJ 2011;343:d4411.
9. Jorgensen KJ, Keen JD, Gotzsche PC. Is mammographic screening justifiable considering its substantial overdiagnosis rate and minor effect on mortality? Radiology 2011;260:621–7.
10. Bewley S. The NHS breast screening programme needs an independent review. BMJ 2011;343:d6894.
11. Raftery J, Chorozoglou M. Possible net harms of breast cancer screening: updated modelling of Forrest report. BMJ 2011;343:d7627.
12. Hackshaw A. Benefits and harms of mammography screening. BMJ 2012;344:d8279.
13. Gotzsche PC, Jorgensen KJ. The breast screening programme and misinforming the public. J R Soc Med 2011;104:361–9.
14. Smyth C. Women misled over breast screening. The Times. 1 September 2011, pp. 3.
15. Richards M. An independent review is under way. BMJ 2011;343:d6843.
16. Vainio H, Bianchini F. IARC handbooks of cancer prevention. Breast cancer screening. Lyon, France: IARCPress; 2002.
17. Tabar L, Vitak B, Chen HH, Duffy SW, Yen MF, Chiang CF, et al. The Swedish two-county trial twenty years later. Radiol Clin North Am 2000;38:625–51.
18. Nystrom L, Anderson I, Bjurstam N, Frisell J, Nordenskjold B, Rutqvist LE. Long-term effects of mammography screening: updated overview of the Swedish randomised trials. Lancet 2002;359:909–19.
19. Tabar L, Yen MF, Vitak B, Chen THH, Smith RA, Duffy SW. Mammography service screening and mortality in breast cancer patients: 20 year follow up before and after introduction to screening. Lancet 2003;361:1405–10.
20. Tabar L, Vitak B, Chen THH, Yen AMF, Cohen A, Tot T, et al. Swedish two county trial: impact of mammographic screening in breast cancer mortality during three decades. Radiology 2011;260:658–63.
21. Cancerresearchuk.org. Breast cancer – UK survival statistics. [cited 24 February 2012] Available from: http://info.cancerresearchuk.org/cancerstats/types/breast/survival
22. Cancerresearchuk.org. Breast cancer – UK mortality statistics 9th October 2009. [cited 24 February 2012] Available from: http://info.cancerresearchuk.org/cancerstats/types/breast/mortality/
23. Autier P, Boniol M, LaVecchia C, Vatten L, Gavin A, Hery C, et al. Disparities in breast cancer mortality trends between 30 European countries: retrospective trend analysis of WHO mortality database. BMJ 2010;341:c3620.
24. Sainsbury R, Haward B, Rider L, Johnston C, Round C. Influence of clinician workload and patterns of treatment on survival from breast cancer. Lancet 1995;345:1265–70.
25. Berry DA, Cronin KA, Plevritis SK, Fryback DG, Clarke L, Zelen M, et al. Effect of screening and adjuvant therapy on mortality from breast cancer. N Engl J Med 2005;353:1784–92.
26. National Institute for Clinical Excellence. Early and locally advanced breast cancer. Diagnosis and treatment. Clinical guideline 80. London: National Institute for Clinical Excellence; 2009.
27. Sant M, Allemani C, Capocaccia R, Hakulinen T, Aareleid T, Coebergh JW, et al. Stage at diagnosis is a key explanation of differences in breast cancer survival across Europe. Int J Cancer 2003;106:416–22.
28. Richards M. EUROCARE-4 studies bring new data on cancer survival. Lancet Oncol 2007;8:752.
29. NHS Cancer Screening Programmes. Screening for breast cancer in England: past and future. Advisory Committee on breast cancer screening. NHSBSP publication No 61. Sheffield, UK; 2006.
30. Duffy SW, Tabar L, Olsen AH, Vitak B, Allgood PC, Chen THH, et al. Absolute numbers of lives saved and over diagnosis in breast cancer screening, from a randomised trial and from the Breast Screening Programme in England. J Med Screen 2010;17:25–30.
31. Kopans DB, Smith RA, Duffy SW. Mammographic screening and overdiagnosis. Radiology 2011;260:616–20.
32. Michell MJ. The breast. In: Sutton D. Textbook of radiology and imaging. London, UK: Churchill Livingstone; 2003. pp. 1451–88.
33. O'Flynn EAM, Morel JC, Gonzalez J, Dutt N, Evans D, Wasan R, et al. Prediction of the presence of invasive disease from the measurement of extent of malignant microcalcification on mammography and ductal carcinoma in situ grade at core biopsy. Clin Radiol 2009;64:178–83.
34. West Midlands Cancer Intelligence Unit. The Sloane Project—UK prospective audit of screen-detected non-invasive carcinomas and atypical hyperplasia of the breast: Progress Report 2008/2009 and 2009/2010. Wakefield, UK; 2010.
35. Francis A. Association of breast surgery, Yearbook 2012. The Association of Breast Surgery at The Royal College of Surgeons. London, UK; 2012. pp. 70–1.
36. NHS Cancer Screening Programmes. NHS breast screening the facts. London, UK; 2011.
37. Baum M, Thornton H, Getzsche PC, Bewley S, Jørgensen KJ, Barratt A, et al. Breast cancer awareness month: still awaiting screening facts. BMJ 2010;341:c6152.