The National Breast Screening service: is it economically efficient?

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Summary

Currently the UK national breast screening programme only offers routine screening to women aged between 50 and 64. Whilst there are good clinical and economic reasons for not screening younger women, there is no compelling argument for not extending routine screening to older women. In this paper, we show that by diverting screening resources to older women, where cancer is more prevalent, more lives and life-years can be saved for no extra cost. Therefore, the current breast screening programme may be inefficient, and offering screening to older women should be given serious consideration.

Introduction

The aim of the UK national breast screening programme is to reduce deaths from breast cancer among women aged 50 to 64. Indeed, the Health of the Nation document requires that the number of deaths occurring in those who are invited to screening for breast cancer be reduced by 25% in women aged 50 and 64 by the year 2000. However, the current breast screening policy of only routinely inviting women aged between 50 to 64 for mammography may be economically inefficient.

One definition of economic efficiency is that for any given set of resources, health gain is maximized. Put in the context of breast screening the relevant question is: can the number of lives saved and life-years gained for all women by the breast screening programme be increased without any additional resources? In this paper, we argue that more life-years can be gained within current resources which implies that the current screening programme is inefficient.

Screening older women

The incidence of breast cancer increases with age. Therefore, all things being equal, the older the screened population, the fewer mammograms required to detect cases of cancer and thereby save lives. As older women have an increased incidence of breast disease, they have a higher capacity to benefit from a screening programme. Indeed, there is evidence to suggest that mammography in women over the age of 64 has a better detection rate and false positive rate, which combined with higher incidence, will result in a better positive predictive value (PPV) compared with mammography in women under the age of 65. Indeed, the PPV of mammography increases from 0.09 to 0.17 for women aged 50–59 to women aged 60–69 respectively. Therefore, exclusion of older women from the routine screening programme can be criticized on two grounds: first, it could be inefficient; and second, it is inequitable.

The main reason that women above the age of 64 have been excluded from routine screening is because of poor compliance. However, the efficiency of the breast screening programme is not affected by low compliance, but by non-attendance to reserved screening slots. This distinction is
important. If a 100 women are invited to screening and 100 screening slots are reserved but only 80 attend, then there is a wastage of 20% of the screening resources, which increases costs. However, if a screening recruitment method is used which requires women invited to screening to confirm attendance, then this allows the 20 slots which would otherwise be wasted to be re-allocated to other women. Alternatively, inviting women to screening and asking them to make their own appointment has a low non-attendance rate. Thus the main economic barrier to excluding older women from the screening programme can be removed.

Cost-effectiveness of screening older women

We have made a cost-effectiveness analysis of transferring screening resources from women aged 51 to women aged 66 and 69 (Table 1). The calculations assume the following. First, a cost-effective recruitment method is being used. Second, that for a 90% screening uptake, a 30% reduction in mortality due to breast cancer will occur. Third, for each screening interval there are sufficient screening resources to screen 900 women. Fourth, for women aged under 65, 90% of the target population will be screened, whilst for women aged over 64, only 45% will attend screening.

The 900 screening slots currently allocated to women aged 51 produce a benefit of 0.158 averted cancer deaths, leading to a gain of 4.8 life years (Table 1). If screening were no longer offered to women under the age of 54, this would lead to a resource saving of 900 screening slots. These freed screening resources can now be reallocated to older women. However, older women have a lower uptake of breast screening than younger women. To keep the calculation simple, let us assume that only 45% of older women come forward to screening, which would lead to only a 15% drop in breast cancer deaths. Note that the effectiveness of a mammogram is the same for young as well as old women. This leads to a gain of 3.23 and 2.83 life years for women aged 66 and 69, respectively. Hence, there is a net gain of 1.26 life years over and above the 4.8 life years gained if screening were still taking place amongst women aged 51, a gain which requires no extra screening resources.

Table 1 Changing resource use to promote efficiency (bold denotes changes in resource use and benefits gained)

<table>
<thead>
<tr>
<th>Age at screening</th>
<th>Screening resources</th>
<th>Breast cancer deaths per 1000 women*</th>
<th>Averted cancer deathsb</th>
<th>Life years gainedc</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>900</td>
<td>0.526</td>
<td>0.158</td>
<td>4.8</td>
</tr>
<tr>
<td>54</td>
<td>900</td>
<td>0.526</td>
<td>0.158</td>
<td>4.25</td>
</tr>
<tr>
<td>57</td>
<td>900</td>
<td>0.875</td>
<td>0.263</td>
<td>6.49</td>
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<tr>
<td>60</td>
<td>900</td>
<td>0.875</td>
<td>0.263</td>
<td>5.81</td>
</tr>
<tr>
<td>63</td>
<td>900</td>
<td>0.875</td>
<td>0.263</td>
<td>5.18</td>
</tr>
<tr>
<td>66</td>
<td>450</td>
<td>1.24</td>
<td>0.186</td>
<td>3.23</td>
</tr>
<tr>
<td>69</td>
<td>450</td>
<td>1.24</td>
<td>0.186</td>
<td>2.83</td>
</tr>
<tr>
<td>Net life-years gained</td>
<td>(3.23 + 2.83) – 4.8 = 1.26</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: OPCS Mortality Statistics Series DH2 no.21. Assumes 30% effectiveness for 90% screening uptake and a 15% effectiveness for a 45% uptake. Remaining life-years calculated from life tables for England and Wales. Life-years are undiscounted, which has the effect of underestimating the relative efficiency of screening older women.

Equity and efficiency

Two commonly accepted objectives of the NHS is that health services are provided efficiently and equitably. Efficiency can be defined as maximizing health benefit from a finite budget. Whereas an equitable health service could be defined as providing equal access to health care to those in equal need or greater access to those in greatest need. The current breast screening programme fails on both efficiency and equity grounds, as those women in greatest need are afforded least access to the service, and the number of life-years gained could be increased.

The current UK breast screening policy assumes that targeting women over 65 would not be worthwhile because compliance is low. However, high compliance does not necessarily imply greater efficiency. If resources are moved from a highly compliant population to a population with lower screening compliance, efficiency and equity are enhanced. This paper supports a previous economic evaluation which showed that the most cost-effective age band for breast screening is between the ages of 65 to 70.

In practical terms moving resources from screening women aged under 55 to women aged 65 to 69 could be achieved by still allowing women aged 50 to 54 access to the service by self-referral (which is
the current procedure for women aged 65 to 69) and then routinely inviting women aged 65 to 69 for screening (and using an efficient recruitment method\(^5,^6\)). However, a sudden change may not enable the service to stay within the existing budget, as more younger women may choose to self-refer than older women. This potential problem could be addressed by either increasing resources to screening slightly or by a gradual process of delaying inviting younger women and then using freed resources to move the age limit upwards by a small amount. This process could be repeated for several years to ensure that the current budget limits are not exceeded.

If the UK breast screening policy was informed by economic considerations raised in this paper, it could lead to an 5% overall gain of life years amongst all women for no extra resources. The current age range of the National Breast Screening service should be reviewed forthwith.

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**References**