Breast Cancer Screening Series: Stephen Duffy

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Mammography screening works

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Since the 1960's, hundreds of thousands of women have been enrolled in randomised controlled trials of breast cancer screening using mammography. It would be difficult to find a medical procedure which has undergone such extensive testing and scrutiny. The randomised trials show a significant reduction in breast cancer mortality, of the order of 20%, with invitation to screening. Since not all women invited to screening actually attend, it has been estimated that the effect of actually being screened is to reduce breast cancer mortality by 30-40%.

So why the debate?

There are three main reservations frequently expressed about mammography screening. First that while the relative reduction in breast cancer mortality seems impressive, the absolute benefit might be small. Second, that nowadays, when there are effective drug therapies, there may be no need for early detection. Finally, concerns have been expressed about the side effects of screening, notably overdiagnosis, which we will come to a little later.

To take the first concern, a common measure of the absolute benefit is the number of women needed to screen regularly to prevent one death from breast cancer. Varying numbers have been quoted, from around 100 to around 2000 needed to screen to save one life. The main reason for this variation is the timescale considered. Screening today does not save lives tomorrow, it saves lives five, ten or even twenty years from now. To see the benefit of screening, we need to consider the long term. When the various estimates of benefit are expressed relative to the same screening regimen, twenty years of screening at ages 50-69, with follow-up for mortality from ages 55-79, the range is much narrower, around 100-300 needed to screen to prevent one breast cancer death [1]. This is clearly worthwhile and cost-effective.

The second concern that there may be no need for early detection in these days of effective drug therapies can be seen to be groundless, when one considers two observations: first that studies of breast screening services in the 21st century show if anything a greater effect on breast cancer mortality than the randomised trials [2]; and second, data on tens of thousands of women diagnosed since 2006 show that there is a persistent survival advantage of diagnosis at an early stage [3].

The final concern about the side effects of screening mainly relates to overdiagnosis. The point of screening is to detect cancer at an earlier, more treatable stage. This means that screening will diagnose breast cancers some years before they would have been diagnosed as a result of symptoms. This advance in the time of diagnosis is known as lead time. For some screen detected cancers, the patient may die of unrelated causes before the cancer would have given symptoms. Thus the cancer would not have been diagnosed in the patient's lifetime if she had never been screened. This is known as overdiagnosis.

The size of the problem of overdiagnosis is difficult to estimate, as after a cancer is treated we cannot know what would have happened afterwards if it had been left untreated. Researchers have tried to estimate overdiagnosis from increases in incidence of breast cancer after screening programmes have been introduced. Estimates vary enormously, with some studies suggesting that 3% of screen detected cancers are overdiagnosed, others suggesting 50%. There are two complications here. First, in most countries where screening programmes were set up in the late 20th century breast cancer incidence was increasing already. Second, an increased incidence will be detected as a result of lead time as noted above. Some of this increase is overdiagnosis, but much of it is bringing forward diagnosis which would have occurred in future years. Those studies which take account of these complexities tend to find overdiagnosis rates of less than 10%. It is also likely that overdiagnosed cases will tend to be very early stage at diagnosis and will not require more aggressive treatment [4].

It is for every woman to make her own choice as to whether to participate in mammography screening. The considerations here indicate that the screening confers substantial long term benefits in terms of reduced risk of dying from breast cancer and that overdiagnosis is relatively rare.

The opinions expressed in this article are the author's own and do not reflect the view of Cancer Knowledge Network or Multimed Inc.

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I am a statistician by training, educated at the University of Edinburgh and Imperial College, London. I have worked in the UK, Singapore, France, Sweden and Russia. I am the Director of the Department of Health's Policy Research Unit in Cancer Awareness, Screening and Early Diagnosis.

For the last three decades, my research has been mainly in cancer epidemiology, prevention and screening. I worked on the pioneering Swedish Two-County Trial of breast cancer screening, on which the UK's national breast screening programme was based.

Since then I have taken a major role in a number of other trials of cancer screening, in breast, colorectal and lung cancer. These include the UK Trial of Flexible Sigmoidoscopy whose results changed national policy within weeks of publication, and the FH01 study of annual mammography in young women at enhanced familial risk of breast cancer, which contributed to the NICE guidelines on breast cancer risk management.