

Health screening: is it always worth doing?

O Durojaiye

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Abstract

Health screening as a preventive care function is targeted at sorting out apparently well people who apparently have a disease from those who probably do not. However, screening is not always effective and appropriate. This article assesses the potential benefits and harms of screening; and makes suggestions for policy makers.

BACKGROUND

Health screening is the systematic application of a test or inquiry, to identify individuals at sufficient risk of a specific disorder to warrant further investigation or direct preventive action, among persons who have not sought medical attention on account of symptoms of that disorder [1]. It is the presumptive identification of unrecognised disease or health risks by the application of tests or other procedures that can be applied rapidly.

Screening is not a diagnostic test nor as good as prevention. Screening procedures are easier to perform and cheaper than diagnostic procedures; their results are usually presumptive and require further tests to confirm a diagnosis.

SCREENING OUTCOMES

There are four potential outcomes:

- True-positive results occur when the test is positive with the disease present. It demonstrates the benefit of screening.
- True-negative results occur when the test is negative with no disease. It gives reassurance, which can be the motivation for screening.
- False-positive results occur when the test is positive, with no disease.
- False-negative results occur when the test fails to detect the presence of cancer.

Equivocal/indeterminate test results are also possible as not all tests show a clear-cut yes or no answer [2].

SCREENING PROGRAMMES

There are numerous screening programmes carried out globally, some of which are national programmes. Some programmes are neither routinely offered (e.g. tuberculosis screening) nor recommended (e.g. prostate cancer in the UK and Canada).

Screening programmes consist of all activities, from the identification of the population likely to benefit to the screening test, definitive diagnosis, treatment and follow-up [3]. They differ between countries in number of ways including: screening interval, eligibility criteria and who bear the cost. For example, in the United Kingdom, mammogram for breast cancer screening is recommended freely for all women aged 50 and over every 3 years [4]. In the United States, the U.S. Preventive Services Task Force (USPSTF) recommends it every 1-2 years for women aged 40 and older [5]. The costs are usually remunerated by different means such as through Medicare. In Canada, the Canadian Task Force on Preventive Health Care (CTFPHC) recommends annual screening mammography for women aged 50-69 years [6]. No recommendation is made for the screening to be included or excluded for women aged 40-49. In Australia, it is provided freely to all women over 40 and specifically targeted at women 50-69 years every 2 years [7].

VALIDITY OF SCREENING PROGRAMMES

Part of the evaluation of screening programmes involves an assessment of their sensitivity and specificity. However, no test is totally accurate (i.e. with 100% sensitivity and specificity); the optimal balance depends on the relative costs and benefits of high sensitivity and high specificity. Positive predictive value is a useful summary of the effectiveness of a screening test. Positive predictive value

indicates what proportion of persons testing positive actually have the disease. It depends on both the sensitivity and specificity of the test as well as prevalence of underlying condition.

SCREENING CRITERIA

A number of criteria first drawn by Wilson and Jungner in 1968 for the World Health Organisation have been extensively used to judge whether to screen [8]. The criteria have been updated to take into account evidence-based practice and concerns about harmful effects. Before implementing any screening services, careful consideration must be given to the question whether or not it is advisable to use screening at that particular time under the prevailing conditions or whether other strategies might be preferable. In the UK for instance, all new screening programmes have to be reviewed by the National Screening Committee (NSC) against 22 criteria before they can be introduced. The NSC mission is to ensure that screening does more good than harm at a reasonable cost.[9]

Essentially, there should be a simple, safe, precise and validated screening test; the distribution of test values in the target population should be known and a suitable cut-off level defined and agreed; the test should be acceptable to the population; and there should be an agreed policy on the further diagnostic investigation of individuals with positive test result and on the choices available to those individuals

POTENTIAL BENEFITS OF SCREENING

The value of a screening programme is ultimately determined by its effect on morbidity, mortality and disability. Screening programmes can be an effective method of reducing morbidity and mortality from disease by detecting it before symptoms occur. For example, studies [10,11] have shown that screening average-risk individuals using faecal occult blood test (FOBT) can reduce colorectal cancer mortality by 15-20%. A report in 2006, by the Advisory Committee on Breast Cancer Screening, shows that screening saves 1,400 lives a year in England [4]. In Australia, mortality from breast cancer among women aged 50-69 was reported to have declined from 62 deaths per 100,000 in 1996 to 52 deaths per 100,000 in 2005 [7]. Evidence also suggests that a reduction in death rates of around 95% is possible in the long-term with cervical cancer screening [12]. The screening of pregnant women to identify and intervene early with risks to their health and that of their babies are associated with improved health status among high-risk populations. From economic perspective, screening

may have cost-effectiveness and cost-utility compared to no screening. For example, the quality adjusted life days saved per person and cost per life year saved with FOBT for colorectal cancer have been reported to be 3.8-8.29 and £1,890- £2,576 respectively [13].

Screening activities carried out for research purposes can help gain information for population monitoring and programme planning. Screening can also provide a rational basis for resource allocation. It can be used to ensure that preventive measures are applied where they will have the most effect.

POTENTIAL HARMS AND LIMITATIONS

Harms from screening include: complications arising from the investigation; unnecessary effects of treatment; unnecessary treatment of persons with inconsequential disease; adverse effects of labelling; costs and inconvenience incurred during investigations and treatment; and consequences of false-negative results. The baseline findings of a UK flexible sigmoidoscopy screening trial for colorectal cancer reported 0.002% probability of perforation [14]; the probability of dying following bowel perforation is estimated as 5.82% [13]. Mammography (breast cancer screening) may be uncomfortable and painful.

The consequences of false-negative results include [2]:

- Medical implications: morbidity and mortality from delay in diagnosis and treatment
- Psychological implications: distress, false reassurance, loss of confidence in services
- Legal implications: such as litigation and costs arising out of litigation
- Economic implications: such as costs to health authorities (e.g. NHS). These are related to the costs of treating a more advanced cancer. Other potential costs include those incurred by the health authorities when re-screening, establishing help lines and dealing with any litigation that may arise.

False-positive results can cause unnecessary anxiety and requires further tests, which lead to more costs and associated complications. In a study, the cumulative risk of false positive for mammograms was estimated to be 49% [15] and 19% of women without breast cancer would undergo biopsy. The risk of false-negatives with mammograms is

6-46% [2].

Screening programmes for large populations are expensive and can divert resources from other healthcare programmes. However, the cost-effectiveness of screening programmes can be manipulated by restricting screening to people who are at high risk of disease.

When an entire population does not share the preconditions for primary prevention and the infrastructure for basic curative services is inadequate to cover the entire population, introduction of screening may exacerbate inequities and retard long-term social development. Alternative approaches that do not involve screening may then be preferable.

A large number of apparently healthy people need to be screened in order to identify a small number of asymptomatic people having the disease. For instance, the number needed to screen in order to prevent one death from colorectal cancer over 10 years is 1,173 [10]; for every 500 women who have breast screening one life will be saved. Thus, a larger number of people may experience harm than those who will benefit from a screening programme. Harm from screening is unavoidable; it has been argued that the popularity of screening tests bears little relation to the magnitude of its benefits and harms [3].

The effectiveness of some of the screening programmes is not always clear. In some cases, the proportion of deaths preventable is unknown. For example, it has been argued that most deaths among women who have been screened for cervical cancer would not have been prevented by screening. Also, for some diseases there is no acceptable treatment, even though there may be a screening test that is effective in identifying those with at high-risk. For example, it has been reported that there have been no reliable evaluations of the effect of treatments for early prostate cancer on mortality. Active treatments for prostate cancer can result in major complications such as incontinence and impotence.

High rates of uptake need to be attained if screening programmes are to have a significant population impact. Screening uptake refers to the proportion of persons eligible to be screened within a population who have been both invited for screening and have received an adequate screen during a specified period [3]. The level of uptake may affect both the effectiveness and cost-effectiveness of a screening programme. The provision and use of screening programmes are also influenced by a number of behavioural, social, economic and organisational factors include participants'

knowledge and perceptions of the symptoms. .

WEIGHING SCREENING BENEFITS AND RISKS

Screening programmes should only be promoted after they have been evaluated and proved effective. This requires a comprehensive assessment to determine whether evidence exists that the benefits outweigh the harms and an assessment of whether resources are being used cost-effectively. This judgement of the balance of benefits and harms is likely to be complex because costs and benefits are qualitatively different and benefits are experienced in different ways by different individuals. However, if screening is effective, the population benefit is usually expected to outweigh the costs. To support such an argument, not only must the benefits and costs of both true-positive and true-negative findings be quantified, but also the consequences of false-positive and false-negative results. Generally, where primary prevention is possible, it should have precedence over screening strategies that aim at minimising health damage but do not eliminate the root causes.

On account of the possible benefits and risks, individuals being screened must receive full and accurate information about the procedure, and give their informed consent. This will help in reducing the implications of screening results. Potential participants in screening should have the opportunity to make an autonomous choice over whether to participate or not.

CONCLUSION

Clearly, weighing the benefits and harms of screening will help to define health policy and future research needs. The benefit of screening is greatest in populations at greatest risk of morbidity and mortality of the condition while the harmful effects of screening are likely to be independent of this risk. Primary prevention is however, better than a strategy that depends on screening especially where an important risk factor can be significantly reduced without medical intervention. Despite, screening carries the potential for a fairly rapid and important impact on mortality from disease, often exceeding what can currently be anticipated from other approaches to disease control. Hence, there should be continuing interest in and research into existing and potential screening programmes.

SUMMARY BOX

- Health screening is not always effective and appropriate

- Weighing the benefits and harms of screening will help to define health policy and future research needs
- There should be continuing research into existing and potential screening programmes.

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Author Information

Oyewole Christopher Durojaiye, MBBS; MPH
Llandudno General Hospital