Journal of Medical
Screening

Editorials

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Medical screening offers great potential for preventing premature death and disability and improving the quality of life. Many patients with serious illness can only be offered palliative treatment; their poor prognosis makes the search for preventive remedies a priority. Medical screening can lay claim to an enormous range of disorders and it encompasses many disciplines, including biochemistry, economics, epidemiology, medicine, radiology, and physics. Marshalling the evidence, developing the right strategies to identify worthwhile screening programmes, and implementing them effectively is no easy task.

This is the challenge which the *Journal of Medical Screening* has been launched to meet. The journal aims to provide a focus for the advancement and development of screening as a scientific discipline. Screening can be of great benefit, but there is perhaps as much potential for doing harm as for doing good. Principles need to be laid down, and several authors have done so.[1–4]

Of overriding importance is that medical screening is intended to benefit the individuals being screened. To avoid confusion the term screening is best not used for other forms of mass testing, particularly the application of tests that pose a threat to those who are tested, such as examinations to determine suitability for employment. The implicit "policing" function is contrary to this concept of screening. Surveys to determine the prevalence of a condition (such as HIV infection) and which do not need to be directly linked to the identity of the person tested are better described as surveillance. It is important that health professionals are careful about their choice of terms to avoid confusion and suspicion of screening.

A definition of medical screening that attempts to encapsulate the central features of the activity is proposed elsewhere in this issue (p 76). The journal aims to promote two axioms.

1 *The early detection of disease should not be an end in itself.* The identification of either trivial or untreatable conditions can cause anxiety and waste resources with no useful practical results. Screening should be concerned only with the detection of preventable diseases or disorders that would otherwise cause significant suffering, disability, or death.

2 *The value of a screening test needs to be determined before it is introduced into practice.* It is important to determine quantitatively the avoidance of disability or premature death that screening will achieve. The benefits can then be set against both the financial costs and the "medical" costs (anxiety, discomfort, adverse effects of investigations, and treatment) so that a dispassionate judgment can be reached.

In addition to scientific papers, the journal will publish features such as a "Noticeboard" of meetings and reports relating to screening activity throughout the world; submission of brief notes on these is invited. There will also be a "Screening Brief" setting out the basic facts on screening for different diseases with a simple assessment of its value. The first, on breast cancer, appears on page 73. This is designed for use by people who may not be closely involved in screening for the disease in question but would like a rapid briefing. It will be prepared by small teams coordinated by members of the editorial board, and will be necessarily didactic. Discussion and correspondence is encouraged. The journal will contain book reviews, which can be used as a peg on which the reviewer can hang an idea or point of view relating to the subject of the book.

Screening often requires the preparation of "Information Leaflets" to help people decide whether they wish to be screened. These are often more difficult to prepare than may at first be apparent. Such leaflets may be published in the journal if they are thought to be of significant value to others and contain new material or employ a novel approach. Protocols may also be published in the journal if they are of special importance. Sometimes it is useful for specialists in screening to have details from a particular study of the estimates of the parameters of screening variables (such as their means and standard deviations and the correlation coefficients between them). These can be considered for publication, either as an appendix to the main article or on their own (appropriately cross referenced) if the main article has been published in a general medical journal.

The launching of a journal devoted to screening is opportune. In Britain the recent report on Medical Research and Health from the United Kingdom Advisory Council on Science and Technology (ACOST) pointed out that potentially effective screening tests have been poorly implemented, while other tests have been introduced into practice without adequate evidence of benefit. Prostate cancer screening is one such example; its efficacy in reducing mortality has not been proved, yet there is pressure to introduce it and it is actively pursued in some countries. The practice of screening has often been fragmented and the subject has not been seen, as it should have been, as an important public service. The report concluded that there had been a lack of direction and overall management responsibility and that the public interest had not always been served by existing screening arrangements. Similar problems are apparent in other countries.

It is our intention that the *Journal of Medical Screening* will improve the present position. The journal will select papers on the basis of how well they advance the subject in terms of practical outcomes. Balancing benefits against costs will be a central issue. It will aim to increase professional and public understanding of the concept of screening, the choices screening offers, the ethical issues, and how screening programmes should be carried out in practice. The editorial stance is that screening procedures of unknown effectiveness and safety should not be introduced as service activity, the overriding philosophy being that screening should be about the prevention of disability

and disease and improving the quality of life, and that the early detection of disease is only a means to this end.

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Editor

1 Wilson JMG, Jungner G. *Principles and practice of screening for disease.* Geneva: World Health Organisation, 1968.

2 Thomer RM, Remien QR. Principles and procedures in the evaluation of screening for disease. *Public Health Monograph*, No 67. US Department of Health, Education and Welfare, 1961. (Public Health Service Publication No 846.)

3 McKeown T. Validation of screening procedures. In: *Screening in medical care: reviewing the evidence.* Oxford: Oxford University Press for The Nuffield Provincial Hospital Trust, 1968.

4 Wald N, Cuckle H. Reporting the assessment of screening and diagnostic tests. *Br J Obstet Gynaecol* 1989;96:389–96.

Guidance on terminology

There is no universally accepted definition of medical screening, but there is general agreement that the activity contains three elements:

(1) It is a process of selection with the purpose of identifying those individuals who are at a sufficiently high risk of a specific disorder to warrant further investigation or sometimes direct preventive action. It is usually a preliminary process to offering a diagnostic test and, if required, preventive action.
(2) It is systematically offered to a population of people who have not sought medical attention on account of symptoms of the disease for which screening is being conducted. It is normally initiated by medical authorities and not by a patient's request for help on account of a specific complaint.
(3) Its purpose is to benefit the individuals being screened. On this basis, mass testing activities such as surveillance for HIV infection or pre-employment examinations to test fitness for work would not be classified as medical screening.

In an attempt to encapsulate these elements the following definition is proposed:

Screening is the systematic application of a test or inquiry, to identify individuals at sufficient risk of a specific disorder to benefit from further investigation or direct preventive action, among persons who have not sought medical attention on account of symptoms of that disorder.

One aim of the journal is to encourage the use of a common screening nomenclature without being too prescriptive or restrictive – a delicate balance, but by making the semantics explicit the issues may be clearer and better understood.

There are a number of alternative terms that are used for the same measures of screening performance.
Detection rate (DR) and **sensitivity** are synonyms (the proportion of affected individuals with a positive test result). An advantage of "detection rate" is that it avoids confusion as "sensitivity" has a different meaning in analytical biochemistry (the minimum detectable amount in an assay). Detection rate can be used in a different sense in cancer screening – as the number of screen positive individuals divided by the number screened. This is better described as the prevalence of screen positive cancers in the population.
False positive rate (FPR) (the proportion of unaffected individuals with positive results) is the complement of **specificity** (the proportion of unaffected individuals with negative results) or (100 − FPR) expressed as a percentage. The advantage of using the term false positive rate is that (*a*) it is more easily understood and remembered, (*b*) it focuses attention on the group who will be offered further medical intervention, (*c*) a 10% false positive rate, for example, is twice as bad as one of 5%, whereas the corresponding specificity values of 90% and 95% conceal the difference.

The **odds of being affected given a positive result** (OAPR) is equivalent to the **positive predictive value** (PPV). The OAPR is the ratio of the number of affected to unaffected individuals among those with positive results (affected positive:unaffected positive). Positive predictive value is the number of affected individuals with positive results divided by the number of individuals with positive results, both affected and unaffected (Affected positive/(affected positive + unaffected positive)). The advantage of the OAPR over the PPV is that the OAPR conveys a clearer impression of the performance of the test when either is high. For example, if the odds of being affected for two tests are 20:1 and 50:1, the equivalent predictive values of 95% and 98% respectively tend to conceal the large difference.

In screening for cancer and certain other diseases there are difficulties in estimating the DR and FPR because the presence or absence of disease is not easily established. The more detailed the investigation, the more cases of disease will be found. The denominator at any point in time may be unknown. A detection rate cannot be determined, although the false positive rate can usually be estimated from the overall positive rate. Alternative measures for the DR are used, such as the ratio of the screen positive cancer prevalence at the first screening examination to the annual incidence in the absence of screening, which indicates the number of years of future cancer the screening examination detects. Another measure which seeks to estimate the detection rate is the number of screen detected cancers divided by the sum of this number and the number of cancers discovered between screening examinations (interval cases). This measure, which has also been called the detection rate, will be a function of the interval duration.

One source of confusion in cancer screening is that the cancer detection rate is sometimes used to describe the prevalence of detected cancers at a screening examination (perhaps better described as the screen positive cancer prevalence, as above) instead of the proportion of all cancers present that are positive.

In other forms of screening, such as antenatal screening for congenital malformations, the estimation of detection and false positive rates is straightforward because the denominator can be determined.

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