Editorial

What is genetic screening anyway?

The increasing tendency to use the term "genetic screening" has drawbacks and should be resisted. The expression is too general. It is used to include not only Mendelian disorders but also chromosomal aberrations and multifactorial diseases with a major genetic component. It even extends to cancers caused by somatic mutations. The term also creates a false impression that something special is being offered that other forms of screening lack. For many people, genes, and consequently all things genetic, are seen as highly determinant, even inevitable, influences. Predictions that soon the whole human genome will be known raise an expectation that "genetic screening" will be able to detect reliably nearly all diseases. These views are unfounded; genetic markers of a disease are, in most instances, too insensitive and non-specific for screening purposes; many cases of the disease will not have the marker, and many with the marker may not develop the disease. Even though the presence or absence of a genetic mutation may be definite, the risk of developing the disease for which the mutation is a marker is usually uncertain. Screening for "genetic" disorders is not, in principle, different from screening in general.

An element of worry among people screened is inescapable, but this can be compounded when the term "genetic screening" is used. The perception that a positive genetic screening result has implications for family members can be a psychological burden. Although this is so in some instances, it is not necessarily the case, because genetic diseases are not necessarily inherited (Down's syndrome, for example). The sense of fatalism that can be generated because one cannot change one's genes adds to the worry. The fact that one may be able to take action – for example, by altering one's diet to prevent the disease – can be overlooked. The concerns and misconceptions arising from the use of the term "genetic screening" have unfortunately already been seeded. They have fostered a need to set up committees and agencies to control "genetic screening" and allay the public anxiety that the term has helped to create. Some concerns are undoubtedly justified – for example, the introduction of tests that will predict diseases for which there is no known method of prevention, but few are unique to genetic testing and the problems are probably best dealt with on a case by case basis as would be done in other difficult areas of medical practice.

Screening for genetic disease is rarely performed using genetic tests, though genetic tests (either based on DNA or chromosome analysis) are often used in the *diagnosis* of genetic diseases. The use of such tests in screening and in diagnosis should not be confused. Cystic fibrosis is perhaps the only current example of a population screening programme based on DNA testing that can be justified. It may be that screening based on DNA testing will extend to other disorders, but this expansion could be more limited than expected. Often there are many different mutations for a disease with any one accounting for only a small percentage of cases, so it is impractical and expensive to test for most of them. (Cystic fibrosis is unusual in that only a few mutations out of the several hundred discovered account for most defective genes.) A test that measures an early biochemical or other manifestation of a "genetic" disease may be simpler, less expensive, and more effective at identifying those individuals who may, without treatment or intervention, develop the overt disease – for example, neonatal biochemical screening for phenylketonuria is simple and highly effective, so there is no advantage in replacing it with a genetic test. Measuring iron overload (transferrin saturation)in haemochromatosis may be better than testing for the mutation. A blood count (mean cell haemoglobin) is used to screen for thalassaemia, and the change in shape of red cells if the pH of their surrounding fluid changes is used to screen for sickle cell disease. A simple test for the disease phenotype may be more sensitive and specific than a test for the genotype. Screening methods for neural tube defects and Down's syndrome use biochemical markers, not genetic tests. An open mind is needed, and the choice of the type of test will vary according to the disease. Even if DNA screening tests become more common in the future, there is no need and no public advantage in declaring the technology used as the screening method of choice.

Another reason for avoiding the term "genetic screening" is that it may imply that *geneticists* should carry out screening that falls under this heading, as screening relies on "genetic" tests. The terminology should be neutral with respect to who does the screening; often screening for genetic disorders requires little specialist genetic expertise. Medical screening is better described in terms of the disease being screened for, as in cystic fibrosis screening, though sometimes an indication of the technology involved is helpful if there are alternative methods (for example, serum screening for Down's syndrome or ultrasound screening for Down's syndrome), but this is unnecessary when there is only one practical method available.

Describing medical screening in terms of the disease that screening is aimed at detecting or preventing not only avoids many of the problems associated with the term "genetic screening" but also has the simple advantage that it focuses on the purpose of screening. In doing so, it keeps attention on the burden of morbidity and mortality from the disease in question, and the extent to which this can be reduced through screening.

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