Genetic screening: ethical issues

Summary
Introduction

New knowledge about human genetics, and the links between genetic inheritance and susceptibility to diseases, have important ethical implications. Medical scientists can now identify the presence of some abnormal genes by simple tests that are easy to administer. But what uses might be made of this knowledge? Who should share it? What are the implications for people identified as having an abnormal gene or genes? For their families? For society?

So far many of the findings of research into the structure of the human genome are provisional and imprecise. But they have already led to controversy, both within the scientific community and in the public at large, about their implications for human well-being. Widespread concern about the ethical aspects of screening for the presence of abnormal genes led the Nuffield Council on Bioethics to set up a Working Party to examine the issues and draw up this report. Issues raised include consent, counselling, confidentiality and the possible use of genetic information by insurers or employers.

Scientific basis

In order to understand the complex ethical questions that can arise in connection with genetic screening, some knowledge of the different ways in which genetic inheritance can cause disease, or make people susceptible to a disease, is essential. A key distinction is between single gene diseases, where the causal link is strong and the outcome often largely predetermined, and polygenic diseases, where there may be interaction with the environment and where the significance of genetic factors is much less clear. A second important distinction, among single gene diseases, is between dominant and recessive inheritance.

The fact that an abnormality in a single gene can cause serious disease has been known for some time. Familiar examples of single gene diseases are cystic fibrosis (CF), Huntington's disease and sickle cell disease. These conditions arise from fundamental defects that are incurable by conventional therapies, though some of them, for example cystic fibrosis and sickle cell disease, may be alleviated by appropriate treatment. Many of them are rare, at least in the UK, and some are more common in specific sectors of the population. Where there is a family history it is often feasible to test selectively, on the basis of a known likelihood that the faulty gene may be present, and to offer individuals and families counselling and advice about the reproductive options open to them.

Polygenic diseases are a different matter. It is becoming clear that an element of genetic susceptibility is among the factors predisposing people to develop many of the common diseases, including coronary heart disease and some cancers. Several different genes appear to influence susceptibility, but how they interact with each other, and the relative importance of genetic inheritance and environmental factors as causes of these diseases, are still largely unknown. Medical researchers are interested in finding out more about the incidence of particular genetic patterns in association with cancers and other diseases. Selective screening on the basis of familial susceptibilities is one way of doing this. However, population screening for polygenic diseases is probably some way off; it will be of questionable value until the causative significance of the genetic factors and the relative importance of the environmental influences are much better understood.
Genetic screening programmes

The phrases ‘genetic testing’ and ‘genetic screening’ are sometimes used interchangeably. There is, however, a significant difference, though not a completely hard and fast one, between testing an individual for a condition or defect that other evidence suggests may be present, and screening all members of a population for a defect or condition where there is no prior evidence of its presence in the individual. An example of the first is testing for the Huntington’s gene in the limited number of families known to be at high risk of developing the disease because they have an affected member. An example of the second is the screening of all newborn children for phenylketonuria (PKU). Testing of a sub-population, such as Ashkenazi Jews for the Tay-Sachs gene, might properly be regarded as screening. Nevertheless, the distinction between testing and screening is important in several respects, including the ethical problems of obtaining informed consent and the handling of unexpected information. In this report we are primarily concerned with the ethical aspects of genetic screening programmes.

We define genetic screening as a search in a population to identify individuals who may have, or be susceptible to, a serious genetic disease, or who, though not at risk themselves, as gene carriers may be at risk of having children with that genetic disease. While it is individuals who are screened, the results will normally have wider implications. Depending on the nature of the genetic defect that is identified and its pattern of inheritance, siblings and other blood relations, as well as existing and future offspring, may be affected.

Genetic screening for some defective genes has become a practical possibility. Further experience of genetic screening can be expected to lead to a more precise definition of its principles and goals; but at present the prime requirement is that the target disease should be serious. The Clothier Committee on the Ethics of Gene Therapy recommended that the first candidates for consideration for such treatment should be those suffering from a disorder which is life-threatening, or causes serious handicap, and for which treatment is unavailable or unsatisfactory. Such disorders would clearly be classed as serious. In the context of genetic screening the definition is likely to be much wider and it is difficult to define precisely what is serious. Furthermore the perception of seriousness may vary between societies and will vary according to treatment possibilities. The fact that the severity of some diseases can range from serious to slight, as in fragile X syndrome, adds to the difficulties. Perhaps it is easier to define what should not be included in genetic screening: these are characteristics with a genetic component, but which cannot be classed as diseases.

Screening programmes have a useful part to play in a health care system that aims to help people maintain good health as well as treating disease and accidents. Already well-established and familiar are the screening of all pregnant women for their rhesus blood group and all newborn infants for phenylketonuria (PKU). Both programmes identify potentially serious risks which can be prevented by timely treatment. Other screening programmes offered to individuals known to be at risk because of their sex and age are for cancers of the cervix and breast. While the latter are not genetic screening programmes, they share some, though not all, of the ethical issues that are discussed in this report.

Ethical issues

The ethical questions raised by genetic screening differ from the ethical aspects of the relationship between individual patients and the professionals caring for them in some important respects. The status of genetic information raises ethical questions that differ significantly from the normal rules and standards applied to the handling of personal medical records. One key difference is that genetics and diseases of genetic origin inescapably
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involve families. Does the person with a defective gene have a right to withhold this information from other family members? Does he or she have a duty to disclose it? What are the rights and/or responsibilities of the rest of the family? Another difference is that for diseases such as cystic fibrosis, where there is usually no prior evidence to suggest that the gene may be present, screening is initiated by a doctor or other healthcare worker inviting a perfectly healthy individual to undergo a procedure that may have worrying implications. The person may be in no danger of developing the illness himself or herself, but may have to consider whether or not he or she is prepared to run the risk of passing on the gene to one or more children, who may then suffer from the genetic disease. A man or woman, asked to accept screening for a defective gene that, if it is present, is not causing any illness and may never do so, is not being asked to consent to treatment in the ordinary sense of the term. The kind of information he or she needs about the possible consequences of a positive result is different from that sought by a patient considering whether to undergo surgery or other medical treatment.

Throughout our report we have kept in mind two fundamental points on the ethics of health care decisions. First, there may be certain courses of action that should be ruled out whatever their seeming benefits. In the context of genetic screening we emphasise that compulsion should be ruled out. Second the question must always be posed: does the potential good outweigh the possible harm? This question is not always an easy one for patients or their medical advisers to answer, even in a conventional doctor/patient encounter where a well-established form of treatment for an identifiable disease is under consideration. It is even more difficult in the context of a screening programme, and especially a genetic screening programme, where the potential benefits to individuals and their families must be weighed against possible adverse consequences.

Genetic screening offers a number of potential benefits to individuals, their families and society. They include:-

(i) the identification of treatable genetic disorders at an early stage;
(ii) giving couples the possibility of making informed choices about parenthood; and,
(iii) more speculatively, and largely in the future, identifying genetic susceptibility to common serious diseases.

As medical knowledge about genetic susceptibility develops further, it may become possible to encourage people at risk to take appropriate preventive measures such as stopping smoking and altering dietary habits. Medical knowledge about genetic susceptibility to common multifactorial conditions (for example, some heart disease and some cancers) is still developing. Even with increased medical knowledge, the individual's risk may be difficult to evaluate.

At the same time, there are the adverse possibilities already indicated. These include the risk of increasing personal anxieties about health, the difficulties sometimes experienced by individuals and families in deciding whether to pass on genetic information to other family members, and the agonising decision whether to terminate a pregnancy following an adverse prenatal diagnosis. There are also potentially adverse consequences for both individuals and society as a whole if normal prospects for employment and life insurance were to be seriously affected by access to, and the misuse of, the results of genetic screening programmes. One serious potential misuse would be an over-cautious interpretation by insurance companies of the as yet limited knowledge of genetic susceptibility, especially to polygenic and multifactorial disease (for example, some heart diseases and some cancers).
The benefits and disadvantages of screening programmes - for individuals, families and society in general - will need to be carefully assessed for each proposed screening programme. Factors to be taken into account include:-

(a) the predictive power and accuracy of the genetic test;
(b) the benefits of informed personal choice in reproductive decisions and their consequences;
(c) the psychological impact of the outcome of screening for both individuals and families;
(d) therapeutic possibilities;
(e) possible social and economic disadvantage relating for example, to insurance and stigma; and
(f) the resource costs and the relative priority, in view of limited resources, of establishing a screening programme.

Against this background our recommendations fall under six main headings. In making these recommendations we are conscious that no-one can lay down fixed and immutable guidelines for the future of genetic screening. Medical and scientific knowledge is developing rapidly: some of that development may alter the shape and the nature of some of the ethical issues discussed in this report. Nevertheless, certain ethical principles will remain unchanged and certain ethical responses will be required from the health professions, from health administrators, from the insurance industry, from employers and from Government.

What is not covered in this report

We emphasise once more that this report has covered genetic screening for serious disease. Distinguishing between serious disease and other medical conditions would be a task that would fall naturally to the central coordinating body envisaged in this Report. We recognise that there is a whole area of serious concern about genetic screening for human traits that are in no sense diseases. These issues have been brought to the fore by recent controversies about gender choice, and about the so-called ‘homosexuality gene’. We do not dismiss these issues. They call for discussion by professionals with skills other than those represented in our Working Party.

I : Providing information and obtaining consent

We do not agree with some recent commentators who have taken the view that so much information is necessary for individuals or couples invited to accept screening for a genetic disease that it is not practicable to obtain truly informed consent at all. Provided that the aim is to provide adequate information, with opportunities for reflection, questioning and further explanation before consent is given, it should be possible to obtain consent in a normal clinical setting. The communication of information is at present likely to be easiest, and best understood, in the context of having children, including preconception and antenatal stages. It should, however, become established outside this framework.

We recommend that adequately informed consent should be a requirement for all genetic screening programmes. The voluntary nature of the screening process must be emphasised. Adequate information must be provided for all those being invited to enter a
genetic screening programme and should include information about the implications for other family members. Information for all genetic screening programmes is best delivered in both written and oral form.

The kinds of information and procedures that people need to help them decide whether or not to be screened for a genetic disorder may be summarised as follows:-

(i) the condition to which the genetic disorder may give rise: how serious is it? how variable is it in its effects? what are the therapeutic options?

(ii) the way in which the disorder is transmitted, ie dominant, recessive and sex-linked mechanisms, and the significance of carrier status;

(iii) the reliability of the screening test, ie the typical rate of false positives and false negatives, and the probability of the development of a serious genetic disease;

(iv) the procedures for informing individuals of the results, negatives (normal) as well as positives (abnormal), and what will be done with the samples;

(v) information about the implications of screening positive (abnormal) for their future and existing children, and for other family members; and

(vi) a warning for pregnant women that genetic screening may reveal unexpected and awkward information, for example about paternity.

It should be made clear precisely what is being screened for at each stage of the screening process. A clear statement of what will be done with the results and with the sample (blood or other bodily fluid) should be provided, and individuals should be able to stipulate that their samples should not be kept.

We recommend that counselling should be readily available for those being genetically screened, as well as for those being tested on account of a family history of a genetic disorder. Counselling should be available at all stages of the screening process. This will require the diffusion of an understanding of genetics (at present mainly confined to genetic counsellors) in particular among those engaged in primary health care. The resource implications, including the need to train large numbers of practice nurses and health visitors in the subject matter and the basic principles of counselling, need to be assessed within the broader context of the expansion and extension of primary care.

Screening of individuals who are unable to give properly informed consent (minors, the mentally ill and those with severe learning difficulties) require special safeguards.

II : The results of genetic screening and confidentiality

The family implications of genetic screening and genetic testing will sometimes require health professionals to review the application of the current principles governing the confidentiality of medical information. Health professional bodies responsible for producing guidelines that govern the conduct of their members will need to examine the implications as experience is gained from the screening programmes now being introduced.

We regard it as axiomatic that:-

(i) individuals should normally be fully informed of the results of genetic screening, and in particular of the implications of those results for the family; and
(ii) the accepted standards of the confidentiality of medical information should be followed as far as possible.

When genetic screening reveals information that may have serious implications for relatives of those who have been screened, health professionals should explain why the information should be communicated to other family members. We recommend that in such circumstances health professionals should seek to persuade individuals, if persuasion should be necessary, to allow the disclosure of relevant genetic information to other family members. They should also seek to ensure that treatment, counselling and other appropriate support are made available to those to whom such unsought information is disclosed.

We note that both the law and professional guidelines provide for exceptional circumstances, when an individual cannot be persuaded to inform family members with a legitimate right to know. In such exceptional circumstances the individual's desire for confidentiality may be overridden. The decision can only be made case by case. We recommend that the appropriate professional bodies prepare guidelines to help with these difficult decisions.

We recommend that the Department of Health should consider with health authorities and the appropriate professional bodies effective arrangements for the preservation of confidentiality, particularly in relation to genetic registers, and should issue the necessary guidance.

III: Employment

At present, the use of genetic screening by employers in the UK does not appear to be a cause for concern. We have found evidence of only one existing screening programme - those who apply to join occupational categories of HM Forces which involve exposure to atypical atmospheric conditions, such as aviation, undergo sickle cell screening. This programme can be justified quite readily on the grounds of safety, not only of those being screened but also of third parties. Nevertheless we recognise that the matter needs to be kept under review. We recommend that the Department of Employment keeps under review the potential use of genetic screening by employers.

Subject to prior consultation with workplace representatives, and with, as necessary, the Health and Safety Commission, we recommend that genetic screening of employees for increased occupational risks ought only to be contemplated where:-

(i) there is strong evidence of a clear connection between the working environment and the development of the condition for which genetic screening can be conducted;

(ii) the condition in question is one which seriously endangers the health of the employee or is one in which an affected employee is likely to present a serious danger to third parties;

(iii) the condition is one for which the dangers cannot be eliminated or significantly reduced by reasonable measures taken by the employer to modify or respond to the environmental risks.

Although it may be appropriate to introduce a genetic screening programme on these limited grounds, it should only be done if accompanied by safeguards for the employee, and after consultation with the co-ordinating body we recommend.
IV : Insurance

We recommend that British insurance companies should adhere to their current policy of not requiring any genetic tests as a prerequisite of obtaining insurance.

Our recommendations about the use of genetic screening and genetic tests by insurance companies follow from the following considerations:-

(i) the difficulty of assessing what may be slender evidence on the genetic susceptibility of individuals to develop polygenic and multifactorial diseases (for example, some cancers and some heart disease);

(ii) an awareness that ordinary commercial practice will lead companies to be over-cautious in their assessment of the risks derived from medical data; and

(iii) the possibility of abuse.

Life insurance and health insurance are the two forms of insurance to which genetic screening is most relevant. Their relative importance varies between different societies. In the UK, where only a minority of individuals currently depend on private health insurance, health insurance is less important than in countries such as the USA, where it is the principal means of paying for health care and, increasingly, has become employer based. In the future, the largely American concern with health insurance in relation to genetic testing may need to be taken into account in the UK, but the need for this consideration would become serious only if there should ever be a major shift in the balance of health care costs from the public to the private sector.

For most people in the UK, life insurance is normally linked to home purchase and the covering of basic family responsibilities. It is therefore of great importance to individuals that they are not excluded from life insurance, and it is to this form of insurance that genetic screening has most relevance. The issue goes wider than the concerns of individuals. If large groups of people categorised by genetic conditions were to become effectively excluded from life insurance, then there would be serious consequences for public policy (including, possibly, for social security).

We recommend that there should be early discussions between the Government and the British insurance industry about the future use of genetic data, and that pending the outcome, the companies should accept a temporary moratorium on requiring the disclosure of genetic data. There should, however, be two exceptions:-

(i) first, in the case of those individuals where there is a known family history of genetic disease that can be established by the conventional questions about proposers' families, then individuals may be asked to disclose the results of any relevant genetic tests; and

(ii) the moratorium should apply only to policies of moderate size. The limit would be a matter to be settled between the Government and the industry in the context of arranging the moratorium.

V : Public policy

By their nature, most genetic screening programmes involve large numbers of people. This is so even for programmes limited to defined groups of the population which may be at risk
of developing a serious disease or transmitting it to the next generation. We emphasise that genetic screening programmes therefore have both an individual and a public dimension.

The threat of eugenic abuse of genetic screening requires safeguards. In a democracy, public understanding of human genetics should serve to create awareness of the dangers of eugenics, and of the possible stigmatisation of those carrying or suffering from genetic disorders. We recommend the need for improving public understanding of human genetics should be borne in mind in any review of the National Curriculum and in the work of all public bodies concerned with the public understanding of science.

We recommend that the Department of Health in consultation with the appropriate professional bodies formulate detailed criteria for introducing genetic screening programmes, and establish a central co-ordinating body to review genetic screening programmes and monitor their implementation and outcome.

As a contribution to the discussion of criteria for screening programmes, we suggest they should include the following:

(i) the aims and purposes of the entire programme;

(ii) the predictive power and level of accuracy of the particular screening test;

(iii) the value to those being screened of the knowledge gained. For each programme this should have been researched as an integral part of the follow-up to the pilot programme;

(iv) the availability of therapy for the particular condition, accepting that lack of treatment does not necessarily mean that screening is not worthwhile;

(v) the potential social implications; and

(vi) the resource costs.