Bioethics for clinicians: 14. Ethics and genetics in medicine

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Abstract

INFORMATION ABOUT A PATIENT'S INHERITED RISK of disease has important ethical and legal implications in clinical practice. Because genetic information is by nature highly personal yet familial, issues of confidentiality arise. Counselling and informed consent before testing are important in view of the social and psychological risks that accompany testing, the complexity of information surrounding testing, and the fact that effective interventions are often not available. Follow-up counselling is also important to help patients integrate test results into their lives and the lives of their relatives. Genetic counselling should be provided by practitioners who have up-to-date knowledge of the genetics of and the tests available for specific diseases, are aware of the social and psychological risks associated with testing, and are able to provide appropriate clinical follow-up. Some physicians may elect to refer patients for genetic counselling and testing. However, it is inevitable that all physicians will be involved in long-term follow-up both by monitoring for disease and by supporting the integration of genetic information into patients' lives.

Résumé

L'INFORMATION SUR LES RISQUES HÉRÉDITAIRES de maladie chez un patient a d'importantes répercussions éthiques et légales en pratique clinique. Comme l'information génétique est, de par sa nature, très personnelle mais quand même familiale, il se pose des problèmes de confidentialité. Le counselling et le consentement éclairé avant les tests sont importants compte tenu des risques sociaux et psychologiques qu'entraînent les tests, de la complexité de l'information pertinente et du fait que, souvent, des interventions efficaces ne sont pas disponibles. Le counselling de suivi est aussi important pour aider les patients à intégrer les résultats de tests dans leur vie et celle de leurs proches. Le counselling génétique devrait être donné par des praticiens qui ont des connaissances à jour de la génétique de certaines maladies en particulier et des tests disponibles à cet égard, connaissent les risques sociaux et psychologiques associés aux tests et peuvent assurer le suivi clinique nécessaire. Des médecins peuvent décider de recommander à des patients de recevoir du counselling génétique et de se soumettre à des tests. Il est toutefois inévitable que tous les médecins interviendront dans le suivi à long terme à la fois en surveillant la maladie et en aidant les patients à absorber l'information génétique.

Ms. F is a 25-year-old graduate student. She consults a family physician at the university health clinic because she wants to know if she is a genetic carrier of myotonic dystrophy. Although there is no clinical family history, myotonic dystrophy was recently diagnosed in her older sister after she gave birth to a "floppy" baby. The physician takes a blood sample, sends it to a DNA laboratory for testing and tells her to phone in 3 weeks for the results.

Ms. G, a 38-year-old woman with 2 teenage daughters, expressed concern to her family physician about her genetic risk for breast cancer. Breast cancer had been diagnosed in her mother when she was 40 years old, and premenopausal ovarian cancer had been diagnosed in her aunt. Ms. G reports that her sisters, aged 35 and 40, are healthy and unconcerned. The family physician refers Ms. G to the local hereditary cancer program. Ms. G receives genetic counselling, con-

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This article has been peer reviewed.

This series began in the July 15, 1996, issue and can be found on CMAJ's Web site (www.cma.ca /cmaj/series/bioethic.htm)..

The views expressed in this article are the authors' and not necessarily those of their supporting groups or employers.

CMAJ 1998;158:1309-13

sents to genetic testing under a research protocol and provides a blood sample. Eighteen months later Ms. G returns to the family physician on an unrelated matter. She is distraught and tells her family physician that she has the *BRCA1* mutation, is at increased risk of dying in the same awful way that her mother had, and that the genetic counsellor is pressuring her to tell her sisters.

What are the ethics of genetics in medicine?

Molecular genetics is concerned with the process by which the coding sequences of DNA are transcribed into proteins that control cell reproduction, specialization, maintenance and responses. Inherited or acquired biologic factors that result in an error in this molecular information processing can contribute to the development of a disease. Medical genetics involves the application of genetic knowledge and technology to specific clinical and epidemiologic concerns. Although many common diseases are suspected of having a genetic component, few are purely genetic in the sense that the genetic anomaly is adequate to give rise to the disease. In most cases, genetic risk factors must be augmented by other genetic or environmental factors for the disease to be expressed. Moreover, the detection of a genetic anomaly associated with a disorder such as Down's syndrome does not help us to predict the severity with which the syndrome will be expressed.

Hugh Malcolm

Predictive testing does exist for a number of monogenic disorders, such as Huntington's disease.[1,2] Genetic testing can be used to confirm a clinical diagnosis, to detect a genetic predisposition to a disease so that preventive measures can be taken or to help a patient prepare for the future, or to give parents the option of terminating a pregnancy or beginning treatment as early as possible.[3] Genetic testing conducted during research contributes to our understanding of the mechanisms of disease and may eventually allow us to identify which subtypes of a syndrome respond well to treatment and which do not. However, the clinical use of genetic testing, which has become common because of its widespread use in research, has been premature. The social and psychosocial implications of genetic information are not well understood, and the development of useful clinical responses to the results of testing has not kept pace with the development of genetic tests.

Certain ethical and legal responsibilities accompany the flood of genetic knowledge into the current practice of medicine. This is because of 3 general characteristics of genetic information: the implications of genetic information are simultaneously individual and familial; genetic information is often relevant to future disease; and genetic testing often identifies disorders for which there are no effective treatments or preventive measures.

Why are the ethics of genetics important in medicine?

Ethics

Although there is no single ethical issue that unifies the field of genetics, informed consent, confidentiality and the potential for social harm and psychological distress are issues that physicians involved with testing should understand. The case examples illustrate the 2 issues, consent to genetic counselling and confidentiality, that family physicians are most likely to be confronted with when managing patients in whom family history or genetic testing may provide valuable genetic information.

Informed consent, which must be obtained before genetic tests are conducted, requires that patients participate in health care decisions. Obtaining informed consent to genetic testing is particularly challenging in view of the complexity of genetic information, the controversial nature of clinical options such as abortion or prophylactic surgery of unknown efficacy, and the social and psychological implications of testing.[4,5] Positive genetic test results are rarely accompanied by the prospect of either treatment or cure. In the absence of effective treatment, the potential for psychological harm and social discrimination must be considered. Patients must evaluate whether the benefit of testing is worth the risk. When genetic testing is part of research, the purpose of the research should be made clear to the patient and uncertainties that might arise as a result of testing discussed.[6]

Patients have the right to control the use of all medical information about themselves, including genetic information.[7] The predictive or risk-assessing nature of genetic information makes it valuable to health care planners, insurers, and people evaluating long-term concerns such as

education, career choices, and risk avoidance and health promotion.[3] The possibility of insurance discrimination has made the confidentiality of genetic information even more important.[8,9] Physicians should ensure that patients understand that after genetic testing their ability to qualify for insurance may be affected. Even though including in clinical records the results of genetic testing conducted in the course of research is not always appropriate,[10] the legal definition of "health care record" includes *all* written information about a patient. Separate records provide little protection to the patient and may compromise care if the genetic information is such that it would affect treatment in the future or be of interest to a family member. Departments of medical genetics do maintain familial records that link the genetic records of individual patients to assist with the clinical services they provide. Nevertheless, information from these records is typically shared with family members only with the consent of the person whose test results are being disclosed. The familial nature of genetic information can create a conflict for the physician, who has a duty to maintain confidentiality but may feel a duty to warn family members of possible risk. Ultimately, the issues of duty to warn and access to health care records will probably be decided by legislation, whereas consent and access to genetic testing will be evaluated on the basis of social and psychological risk.

Law

Although a ban on germ-line genetic therapy and on prenatal screening for sex selection was proposed as part of the Human Reproductive and Genetic Technologies Act (Bill C-47),[11] currently there is no specific legislation relating to the use of genetic information in Canada. There are 3 main legal issues that apply to clinical genetics: informed consent to testing; standard of care, including genetic counselling for adults and pregnant women wanting to undergo testing; and the duty to warn family members who may be at risk.

There are other legal and ethical issues that are beyond the clinical focus of this article. One is whether patent laws that apply to genetic research serve the public interest.[12] A second is whether legislation should protect people from the use of genetic tests as a basis for discrimination by employers and insurers.

Explicit informed consent to a genetic test is required because genetic testing carries considerable risk of social harm in the form of discrimination. A patient might reasonably consider that the possibility of discrimination would outweigh the benefits of the test, particularly if no effective treatment or preventive measures are available.

There is no standard of care for clinical genetic practice, and the test and counselling programs that are offered vary among provinces. However, current case law indicates that physicians have a legal obligation to inform patients of the availability of prenatal testing.[13–15] Generally, geneticists suggest that obstetricians offer prenatal tests when the risk of a serious genetic condition outweighs the risk of spontaneous miscarriage caused by amniocentesis or chorionic villae sampling. Much genetic testing is conducted as research, and aspects of a study design, such as the use of cloning or the objective of gene therapy, may be relevant to physicians or patients. Ethical concerns specific to genetic research are beyond the scope of this article and are discussed elsewhere.[6,10,16,17]

The duty to warn family members about a genetic condition is based on the premise that the warning is necessary to avert serious harm. As discussed in an earlier article in this series,[7] any breach of confidentiality must be based on a realistic assessment of whether the disclosure will effectively prevent serious harm. This breach of confidentiality is rarely justified, except in cases where prevention or treatment is possible, such as for familial adenomatous polyposis.[18–20] A physician contemplating warning a family member about a genetic risk should be able to answer "yes" to the following questions:

- Is the family member at a high risk of serious harm?
- Does the breach of confidentiality actually make it possible to prevent or minimize the harm?
- Is the breach of confidentiality necessary to prevent or minimize the harm (i.e., has the patient refused to disclose the information or to give consent for its disclosure).

Policy

Policy guidelines and recommendations are often established for specific diseases with genetic components. The most common theme of such guidelines is the requirement for pre- and post-test genetic counselling. The importance of having a competent professional provide the counselling has been noted, but there are not enough specifically trained genetic counsellors or clinical geneticists to handle the anticipated caseload as genetic testing becomes more common.[21,22] There is general agreement that health care professionals who provide genetic counselling must be well-informed about the nature of the condition and the social and psychological implications of genetic testing, and must be able to interpret the test results and assess specific familial genetic risks.[23–27]

Empirical studies

Much of the empirical work in genetics and ethics has related to studies of knowledge of genetics, attitudes toward testing, and the psychological effects of available ge-

netic tests. These studies have shown that among Canadian health care professionals, understanding of genetics is poor[21] and there is wide practice variation with respect to genetic testing.[22] Most research into specific diseases suggests that when it is accompanied by adequate counselling, genetic testing is safe and beneficial, even when effective treatments or preventive measures are not available. For example, studies of predictive testing for Huntington's disease found that the psychological well-being of patients improved after testing, and few of the suicidal and depressive episodes that were anticipated actually occurred.[27–29] Despite an emphasis on a nondirective presentation of all options in genetic counselling, studies have found that the subtle influence of counsellors' values may affect patients' choices.[30–33] Psychologists and members of families at risk have pushed for research that is more process- and family-oriented,[34,35] and new studies have tried to determine the effect genetic knowledge has on self-concept and family relationships. Some studies even suggest that the most significant and ethically relevant effects of genetic testing may be on the relationship between the health care provider and the patient and among family members.[36–39]

How should I approach ethics and genetics in the practice of medicine?

Media coverage and the very significant investment being made in genetic research will likely increase the number of patients who want to discuss genetic risk and testing with their family physicians. It is not appropriate to simply order genetic tests and then deal with the results and implications if the test is "positive." Consent and confidentiality require a thorough discussion and realistic planning before the test is conducted.

Genetic counselling has been developed to manage the delivery of complex information and the moral controversies surrounding such issues as abortion and lifestyle changes. It also meets the ethical requirement of informed consent and provides support for patients facing testing. Counselling involves a detailed disclosure and supportive discussion designed to help patients understand these issues as well as those related to genetic research and duties to family members (e.g., banking of tissue samples for future DNA testing, the social risks and obligations of patients to family members that may affect confidentiality).[17,40,41] Counselling should also clearly establish that there is a possibility that paternity might become an issue, but this is not typically included in the information disclosed. Genetic counselling includes following up with patients to ensure that they have been able to integrate test results and their implications into their lives. One of the primary purposes of the testing is to help patients plan for the future. However, genetic counsellors and geneticists cannot always anticipate or understand how familial and social influences will affect the way a patient responds to and uses genetic information.[30,36,37,42]

As with all medical information, genetic information should not be disclosed to third parties or family members without the patient's consent. The exceptions are those rare cases where treatment or preventive measures are available and family members are unaware they are at risk.[7,18–20] People buying insurance are frequently required to divulge all risk information and to sign a release form that gives the insurance company access to their health care records, which may include genetic test results (whether clinical or research).[8,9] Concealing genetic test results from an insurance company may nullify a policy, which could negatively affect a person's future health care. When appropriate, the options for DNA banking, including current or future access by family members or researchers should be discussed with the patient.[41] Family physicians and specialists must share the burden of integrating genetic information into the health care system. However, physicians may find that requests related to specific diseases may be too infrequent to justify investing time and resources in learning about them. Physicians who have patients interested in genetic testing will have to evaluate whether to refer those patients to genetic centres or to take on the responsibility of genetic counselling themselves.

The cases

Ms. F received genetic testing without adequate counselling. In such situations the informed consent may be invalid and the patient may not be adequately prepared for the information the genetic test provides. Results should be delivered in a supportive manner so the patient understands the implications of the test information and can begin to work through the accompanying risks and responsibilities. Delivering the results over the phone is not supportive. In order to counsel a patient, the physician must know and communicate the risk of being a carrier, which can be as high as 50%. The physician should have asked Ms. F why she wanted to know her status to determine whether she understood the purpose of genetic testing and whether genetic testing would meet her needs.

The family physician referred Ms. G to a local hereditary cancer program for counselling and testing. Most genetic counselling programs include a discussion about the need to talk to family members about genetic risks. For genetic testing to be included in a research protocol, counselling would likely be mandated by a research ethics board.[17] The issue that remains is how the family physi-

cian can help the woman deal with her test results, including whether and what to tell her sisters. Any breach of confidentiality on the part of the physician must be justified by the risk of serious harm and the benefits of disclosure. The sisters could be told that they have a 50% chance of having a mutation that would significantly increase the risk of breast or ovarian cancer developing in them before age 65. The physician has no way of knowing how the sisters would react to this information but must assess how useful it would be to them. There is no guaranteed prophylaxis for breast cancer but early detection and treatment may lead to a better outcome. There are social and psychological risks associated with informing and not informing the sisters. At this time, the speculative nature of the benefits of knowing they are at increased risk does not support a legal duty to warn the sisters, although it may be ethically permissible.[22] To respect Ms. G's confidentiality, however, the physician should continue to encourage her to discuss the genetic risks with her sisters.

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