

# Primary Health Care Ethics in the Wake of the Human Genome Initiative.

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**T**he Human Genome Initiative, or Human Genome Project, is an international collaborative effort to sequence the human genome. This will enable us to better understand genetic information and to apply this knowledge in the prevention or treatment of disease. Presently, and following the completion of the project, physicians in various fields of medicine will be required to possess the knowledge, skills and ethical demeanour to deal with genetic counselling, screening and testing of patients. It is obligatory that the medical community prepare for the increased ethical attentiveness that will be required of them in the face of this new genetic knowledge.

## INTRODUCTION

Few technological milestones can rival man's landing on the moon or harnessing the power of the atom, but the Human Genome Initiative promises to be just as remarkable. Historically, the Human Genome Initiative is the collective name for several projects begun in the late 1980s in several countries. It followed the United States Department of Energy's decision to create an ordered set of DNA segments from known chromosomal locations, develop new computational methods for analysing genetic map and DNA sequence data and generate new techniques and instruments for detecting and analysing DNA (1). The current phase of the Human Genome Initiative involves identifying and localizing the estimated 50,000 to 100,000 genes in the human genome by sequencing three billion base pairs on twenty-three chromosome couplets (2-4). Total costs are anticipated to be approximately three to five billion dollars (5) with expected completion in the year 2005 (2-6). The aim of the program is to increase our ability to predict, understand and eventually prevent or cure human diseases (6).

The Genome Initiative will provide us with the sequences of all human genes.

Gene mutations are now known to play a role in many common human diseases, such as heart disease, diabetes mellitus, immune system disorders and cancer (6). Genetic diseases and congenital malformations occur in approximately 3-5% of all live births (7). There are about 3,000 medical disorders predicted to result from a single altered gene, with discoveries of the genes associated with specific disorders being announced almost monthly (7). Identifying genes unique to a disorder will make it possible to introduce more efficient screening programs for populations considered at risk. Furthermore, with increased understanding of the interaction between genes and the environment, we may be able to manipulate environmental factors early on (7), minimizing the development of genetically-determined illnesses.

It is imperative that the possible use or misuse of the project's findings be anticipated and addressed. To this end, the US National Institute of Health has allocated three percent of its budget for the Human Genome Initiative to bioethical analysis (8), making this the first scientific project that from its inception has incorporated a commitment to studying ethical, legal and social issues (9). The potential future ability to generate any individual's genetic profile raises important questions of privacy, confidentiality, ownership and autonomy. How should information be protected? Who should have

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access to the information and under what circumstances? What rights, if any, do employers, insurers and family members have to an individual's genetic information? Diagnosis of many genetic disorders will be possible before treatment becomes available. How will we resolve dilemmas raised by such a gap (3)? How might the Human Genome Initiative affect our concepts of 'disease,' 'normalcy' and 'humanness' (6)? Physicians must ponder how they will divulge potentially distressing genetic information to patients, how they will protect patients from the discrimination of interested third parties and how they will prepare and educate the community about the increasing role of genetics in medicine (5). Although all specialists will have to consider the impact of genetic information in their work, the issues will be encountered earliest and most frequently by family practitioners, obstetrician-gynaecologists and medical geneticists. It is therefore paramount that such primary care professionals be well-versed in the changes, especially increased ethical awareness and responsibility, that will take place in medical practice.

Physicians will not only be expected to be adept at performing genetic screening, but they will also necessarily become ethical gate-keepers. Genetic ailments affect millions of people worldwide who must live with their own version of the disease daily. Genetic screening and therapy may one day be commonplace in our arsenal against illness. Primary health care providers, as the first line of intervention, must learn how to manage the new genetic information arising from the Human Genome Initiative. This paper will discuss the pertinent ethical matters with which physicians will cope in this era of genetic advances, matters which will become more defined in the years following the completion of the Initiative.

## ETHICAL IMPLICATIONS FOR PRIMARY HEALTH CARE PROVIDERS

The concerns arising from genetic research are not new. What is novel is that the Human Genome Initiative is the first undertaking that raises all the ethical issues at once (5). Presently, genetic screening is available for a very limited number of diseases, including Down syndrome, Tay-Sachs disease and cystic fibrosis. But with the estimate that gene defects underlie 3,000 to 4,000 different diseases, not including polygenic etiologies, we are, as one author put it, "in a lull before a storm of information." (10) It is critical that national or even international agreement on principles guiding gene research and its clinical applications is reached before the Initiative makes its full impact on medicine. Moreover, it is not solely the responsibility of physicians to take charge of the ethical matters surrounding genetic advances. These issues impact on all of humanity and must be addressed by all. As intermediaries between technology and the patient, however, primary care phy-

sicians have a unique obligation to join in the consideration and debate of these issues (11). Existing genetic counselling services do not replace the necessity to explain the implications of a genetic test in the primary care setting (12, 13). All physicians must be educated in the science of clinical genetics and be aware of the moral issues surrounding the new technologies.

### *Classical ethical concerns related to the management of genetic information*

The most direct ethical implications for primary care physicians dealing with genetic consultations will be in the management of information. Issues in this arena concern voluntariness of the patient, coercion on the part of the health professional, maintenance of confidentiality, access to information by third parties, securing informed consent and upholding patient autonomy. Conventionally, health care ethics has distinguished between rights and duties, i.e. the rights of patients balanced against the duties of physicians. Patients' rights include the free and uncoerced authority to reach a decision (the principle of autonomy) and the right of consenting to medical care after disclosure of all the necessary information needed to reach a decision (fully informed consent). Physicians have traditionally been seen as protectors of the patient and have been guided by the duty of doing no harm to the patient (the principle of beneficence or non-maleficence). Although much philosophical debate has surrounded the rights-duties dyad, it is apparent that in every clinical situation, physicians must balance all ethical issues in striving to give the patient the best medical care they can.

### *Lack of physician readiness to manage genetic data: an ethical infringement*

Perhaps the most fundamental concern is the unpreparedness of physicians to meet the challenges that the new genetic technology will pose. Evidence suggests that several barriers exist to the adopting of genetic tests by physicians. These include lack of knowledge, inability to interpret probabilistic information, low tolerance for uncertainty, negative attitudes about their responsibility for genetic counselling and testing, lack of confidence in their clinical skills and unfamiliarity with ethical issues raised by testing (12). Physicians differ in their translation of test results, some claiming, for instance, that a risk of 1 in 2,500 for cystic fibrosis is "common" while others claim it is "rare" (12). It has also been reported that physicians sometimes intentionally misrepresent information to patients, including some related to screening (14). Studies have shown that there is a tendency to under-estimate the importance of unknown information and over-estimate what is known (15). In past surveys, many physicians have expressed negative attitudes towards additional training in genetics, favouring specialized counselling clinics instead (16). If many physicians lack confidence in their ability to

provide genetic tests and counselling, they are less likely to do so.

Important ethical ramifications stem from these 'barriers of unpreparedness.' If physicians possess inadequate knowledge and counselling skills regarding genetic testing, is it ethical for them to offer such tests? What obligations do they have to their patients in the face of uncertainty? In the new era of human genome research, without adequate training, non-geneticist physicians may not be able to define the benefits and burdens or to understand genetic testing. They will be unable to appeal to the principle of beneficence - acting in the patient's best interests. They will also be unable to appeal to the principle of patient autonomy, or right to make an uncoerced decision (12). Without a fully informed consent, autonomy is violated, since autonomy is the principle upon which informed consent is based. As well, unprepared physicians could undermine the validity of the process of informed consent by acting coercively or manipulatively (12). Moreover, if lack of knowledge, lack of confidence and low tolerance for uncertainty are, indeed, barriers to action, even appropriate, prudent and beneficial applications of genetic technology are likely to be withheld from patients who need it (12).

#### *Making ready - a professional obligation*

How can physicians prepare for this responsibility? Training for primary care practitioners is needed in the areas of human genetics and counselling patients before and after such testing. This could be integrated into residency program curricula, for example, via case conferences (13). An interesting idea proposed to solve the burden of genetic counselling is the development of computer-based interactive video programs to provide standardized patient-specific presentations (7). As well, clinical standards are needed to guide conduct for all physicians in the dissemination of genetic information. The Canadian College of Medical Geneticists, for instance, has adopted a code of standards on counselling (5).

Physicians, as holders and utilizers of the new genetic knowledge, must take an active role in educating the public about the implications of genetic testing and manipulation. The lay community should be made aware of their options regarding genetic testing in order to make decisions regarding personal lifestyle choices, as well as in considering reproductive alternatives. They must also be warned of the limitations - we cannot expect to cure all disease within twenty years and must not look upon genetic manipulation as a panacea for the world's woes (1). The importance of evaluating public values toward genetic testing is critical in appreciating patient response to future screening and in developing public policy (17).

## SIGNIFICANCE AND ETHICAL CONSIDERATIONS OF GENETIC TESTS

Issues of predictive value become important when considering the expanding array of genetic testing technologies (18). For particular tests to become professionally adopted, it will be necessary to establish minimum acceptable levels of sensitivity and specificity. Specificity is critical because a large number of false-positive test results produces extreme mental suffering for healthy persons who are told that they may develop serious genetic disorders (2) and may necessitate additional unnecessary investigations. Similarly, sensitivity is crucial because false-negative test results would give a mistaken sense of security to persons with genetically-based susceptibilities (2). Neither the ability nor the desire to change behaviour is distributed equally among all individuals. For example, individuals who are told they are not at a genetic predisposition to develop lung cancer may continue to smoke. This is problematic for two main reasons: the test results may be falsely-negative and the individual at stake may still develop lung cancer for non-genetic reasons. Many of us have an incorrect view of heritability - that genes are destiny. However, researchers are well aware that expression of the same genes in disparate environments may result in different outcomes and so lifestyle is just as pivotal a consideration as genetics with regards to the onset of many diseases. Physicians must, therefore, clearly communicate the uncertainty of test results and dispel the prevailing misconception of heritability to their patients. The same worries are held for home test kits for genetic testing (8).

#### *Eligibility of genetic ailments for screening and potential discrimination of those tested*

Because DNA analysis has the potential to provide so much information, it poses ethical problems about which genetic disabilities should be considered as candidates for prenatal diagnosis with the option for termination of pregnancy (17). What constitutes a serious genetic disability? Physicians will be called upon to counsel patients who want to terminate a pregnancy because they do not wish to bring a genetically disabled child into the world. Is a potential child with Down's syndrome a candidate for an abortion? Is it appropriate for society to decide that physical disability is always undesirable (17)? Traditionally, primary health care providers have embraced the merits of preventive medicine, especially for conditions which cannot be cured. In the sphere of human genetics, it is probable that we may eventually be able to correct genetic anomalies through somatic cell or germ-line genetic manipulation. Would it still be ethical to allow termination of pregnancies, in keeping with the view that in genetics, avoidance equals prevention? Society must

decide and medical professionals will be responsible for upholding society's values. History has seen the misuse of genetics during the eugenics movement and most will agree that sex selection or selection of desirable traits, such as height, are not criteria for stopping a pregnancy. Similarly, it will be very important that in our efforts to screen and avoid serious genetic disease we do not forget to pay enough attention to developing methods to treat these conditions. It is unlikely that we will be able to develop screening programs to cover all genetic disease. In any case, the widespread use of selective abortion should not be the ultimate goal of clinical genetics (17).

Physicians must also be wary of discrimination imposed on persons who have been given the label of a genetic disease. Social stigmatization is unlikely to be wholly erased but physicians must ensure that patients are not overcome by the bias of biological determinism that "we are our genes," which is simply not the entire story. Information improperly given can damage morale and self-esteem and alter important decisions (5). Particular genetic labels might have lasting effects on parent-child bonding, peer relationships, school performance and expectations and in adolescence, on career choices and life plans (11). Family physicians and pediatricians will be called on to explain and interpret the results of a multitude of tests to anxious parents and the manner in which this information is presented may permanently affect the parents' view of the child (11).

#### *Selection of candidates for genetic testing: issues of justice and resource allocation*

Issues of distributive justice emerge when the proposed costs of genetic counselling and intervention would keep certain members of society from using them. Testing may run to thousands of dollars per patient - for testing, physician visits, and genetic counselling (13). Thus, rationing such technologies may prove necessary. Future queries need to focus on which diseases will be tested for, which patients will be tested and what funds will be used (13). We should be aware that genetic prediction transfers accountability and responsibility for health to the individual, decreasing society's responsibility to eliminate the adverse social circumstances (8). This promotes a potentially coercive model of medicine, and may lead to 'victim blaming' of those who do not follow what is supposedly 'sensible' advice for their health. Physicians must be responsive to this and society as a whole must examine the claims of potential benefits versus harm (13).

#### *Attending to patients' psychosocial needs*

Psychological grief can ensue following disclosure of a genetic disease, especially if it is life-threatening or a cure is not available. Some patients may not want to know such information. Others who initially think that they desire such knowledge may change their

minds after careful consideration of the consequences (2). Thus, an issue in divulgence of genetic information for physicians is a predisclosure discussion of ways that genetic information may affect patients' lives psychologically and socially, as well as economically (2). It would be an act of beneficence for physicians to do so. Furthermore, in the somewhat polarized fiduciary relationship that exists between physician and patient, sensitivity to such issues increases the patient's confidence and trust in the physician and the health care system, which is seen to look out for the whole patient, and not just his or her physical disorder. The Canadian Collaborative Study of Predictive Testing for Huntington's Disease (CCSPT) was launched in 1988 and included the participation of fourteen genetic centres from across the country, all following the same clinical research and protocol. After completing the first year of follow-up on participants in this study, it was found that there was little evidence to suggest that predictive testing for Huntington's disease had harmful effects on either the increased or decreased risk study groups (19). Moreover, no significant differences were found between the study groups with respect to the proportions of individuals who experienced severe psychological difficulties during the test follow-up period (20). The success of this trial should be a model for future genetic testing endeavours.

A not uncommon complication of genetic testing is the question of additional information which may be obtained as part of a genetic screening procedure, for example, a finding of non-paternity (17). When carrying out prenatal diagnosis by DNA analysis, particularly if genetic linkage is used, it is absolutely vital to determine the biological parentage of a fetus (17). Since non-paternity may lead to a mistaken prenatal diagnosis result, it is important to tell mothers as part of the counselling procedure that these tests will be valid only if parents are the true biological parents of the child (17). Perhaps physicians, when confronted with instances of non-paternity, are justified in breaking the general rule that all information found during genetic analysis should be disclosed.

#### *The right not to know*

Autonomy usually connotes the concept that patients ought to know as much as possible before making a decision. In existing genetic services, we recognize a right not to know our genes (1). What moral issues does the physician face in circumstances like this? Consider the following case:

A newly married couple - a 24-year-old man and his 22-year-old wife - come to the family practice clinic to discuss their plans to have children. There is an extensive family history of cystic fibrosis. The physician suggests that the patients have genetic tests for cystic fibrosis. The husband agrees but the wife adamantly refuses, saying "I just don't want to know." The physi-

cian's and husband's attempts at persuasion are ineffective. The wife reasons that the emotional consequences of such knowledge would be too burdensome on her marriage and her potential children's future (2).

Even though the wife in this case is certain she does not want to know about her genetic profile, it would not rule out the physician's duty to provide genetic counselling in which she is presented with information regarding the relative benefits and burdens of testing. For patients who are not as certain as the wife in this situation, physicians should be prepared to offer counselling that presents information regarding genetic testing in as neutral a manner as possible in keeping with health promotion goals (2). It would be beneficial to provide screening programs in family practice settings that offer an option for patients who simply "don't want to know" to refuse testing after appropriate discussion. This approach would not compromise the moral interests of patients with conscientious objections to acquiring genetic information (2).

#### *Maintaining positive intrafamily relationships*

Family members may not necessarily be cooperative or truthful in disclosing test results among themselves. The concept of a "family covenant" may help in highlighting the responsibilities of individuals within families and guide their interactions with their family physician (13). The family covenant is a patient care model that describes a contract between a family and physician in which boundaries may be set on the information family members divulge to each other as well as on that which the physician may discuss with individuals within the family (13). The decision not to share one's test results with others could involve privacy claims - a right not to have one's life interfered with by others. As well, it could entail confidentiality claims - that a physician caring for two family members has an obligation not to violate the confidence of one patient by disclosing information to the other. Such redefining of the physician-family relationship may become necessary with the advent of new genetic technologies.

## CONCLUSION

With the completion of the Human Genome Initiative, humanity will have reached a new and exciting frontier in the realm of understanding and conquering disease. Medical professionals will have to meet the demands of genetic testing, screening and manipulation by increasing their knowledge of genetics and their ethical awareness. They must meet the holistic needs of individuals, including the physical and also the emotional and economic concerns of patients. Society must be made aware that the prevailing responsibility is not a proximate one, but a long-term duty to future generations. In particular, we should not be blinded by the 'illusion of control' (18) the Human Genome Initiative will have over social problems. Physicians will have to

renew their awareness of ethics and human psychology and agree upon policies that will guide the use of new genetic knowledge. Attention to such matters now, rather than later, will smooth the transition to the 'genetic era' and will enable humankind to benefit from forthcoming medical advances in genetics.

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