

# 17

## Genetic Screening, Testing, and Families

"I'll never understand why my mother chose to put her faith  
in God rather than her geneticist."  
—little boy in the 1997 film, *Gattaca*

Even before scientists focused on cracking the human genetic code, our cultural expectations and fears about a Genetic Revolution were depicted in stories, films, and other media, raising such questions as:

What is the essence of being human?

How much will we try to control the sex, the temperament, and the genetic heritage of our children?

Popular reactions to the advances in genomics and the expanding realities of genetic testing will seriously affect primary care at both the individual and the family levels. Obtaining a family history will now more specifically include genetic screening for every patient. As a result, many patients will at least consider genetic testing especially as more genetic tests become available. For these patients, primary care clinicians will need to provide some form of genetic counseling.

Genetic testing refers to the examination of a person's DNA or biochemical products of the DNA to gain information about the current or future health status of that person or his or her relatives. Genetic testing may be used to predict whether a person will develop or is at increased risk of developing symptoms of a particular disorder or if a person is at increased risk for having children with a particular disease. Prenatal genetic testing is used to determine if an unborn child will have a genetic condition. Testing may also be used to confirm a diagnosis.  
(1)

Testing is now available for many single gene-dominant disorders like Huntington's disease and those illnesses traditionally thought of as "genetic." Tests are also rapidly becoming available for mutations implicated

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in such illnesses as breast and colon cancer. Many illnesses involve some combination of genetic and environmental influences, with variable levels of certainty about when and how the illness will be expressed. These gene mutations represent “susceptibility genes” that will allow clinicians to focus on medical and behavioral prevention. With the ability to know which illnesses a patient is at risk for developing, the hope is that diagnosis and treatment can be rendered more sensitive, specific, effective, and safe (2); however as Frances Collins, the Director of the Human Genome Project, said, “. . . premature introduction of predictive tests, before the value of the information has been established, actually can be quite harmful” (3).

The rapid developments in genomic science have indeed far outpaced our understanding of their concomitant psychosocial, ethical, and legal implications. As with every scientific advance, clinicians attempt to apply a rational process for evaluating the value and appropriate role of these technological achievements for each patient in his or her family and community context. For some patients, genetic counseling and testing brings relief, and hope for prevention. Testing can reduce anxiety and improve the accuracy of perceived risk (4). For a minority of patients, test results may be informative, but distressing over time (5). *Genotype* implies permanence and immutability. Patients may believe that these tests will allow them certainty and prediction about their life course that is actually far from our grasp. Adding to the complexity, genetic concerns are inevitably both an individual and a family issue. What one individual thinks is right for him or her may conflict with what other family members think is in their best interest.

This chapter will take into account the multiplicity of scientific, psychological, and cultural issues involved, and lay out some guiding principles for primary care assessment and counseling that can be adapted to each individual situation as new scientific developments enter mainstream health-care. We will divide the chapter into four chronological phases: risk assessment and genetic screening, pretest counseling, posttest counseling, and long-term follow up.

## Raising the Possibility: Risk Assessment and Genetic Screening

Primary care clinicians presently often undertake the first steps in genetic screening, though that initiative may shift to the patient as more information penetrates mainstream culture. Patients themselves may raise questions about their risk for inherited illness at points of life transition, such as the decision to marry or to have a child. Being the first line of assessment requires that primary care clinicians educate themselves so as not to under- or overstate risk for any particular genetic illness (6). Genetic factors exist for most common chronic, serious disorders, including coronary artery

disease and cancer, but their precise influence remains unclear. Heredity also affects susceptibility to many familiar, less lethal disorders (e.g., glaucoma, migraine, osteoporosis, peptic ulcer, and rheumatoid arthritis). Certain psychiatric or behavioral problems (e.g., depression or alcoholism) appear to have a genetic connection.

Clinicians should consider a hereditary influence when they learn about a disease that has an unusually early age of onset, occurs in multiple family members, and develops in otherwise low-risk people, among other factors. In many cases, however, nongenetic factors like social or environmental forces may be more important than genetic ones in the development of a disorder.

The genogram (or “pedigree,” as geneticists refer to it) provides the basic template for all individualized genetic risk assessment (as opposed to generalized population screening) (see Chap. 3 for how to draw a genogram). (7) A thorough three-generation genogram that includes diseases with a genetic connection is a traditional component of the medical history. Ethnic origin should be recorded because it is important for many conditions (e.g., hemoglobinopathies, breast cancer, etc). Age and cause of death should be included for relatives who have died. For significant illnesses, record age at diagnosis (in live and deceased relatives) because this information can help to establish a possible genetic connection. Ask particularly about any congenital problems in biologically related relatives, because these details are relevant to a pedigree and are not often offered spontaneously (8). Some organizations and programs now offer a service that guides the patient through a computer-generated family history questionnaire (e.g., see the University of Virginia Web site).

Jeanine and Al Murphy, both of northern European heritage, just moved to town and were thinking about having children. Jeanine made an appointment for a routine physical with her new physician. The office sent a health history form to Jeanine prior to her appointment. The physician then asked further questions from the form during her first visit, and learned that Jeanine’s mother and grandmother died of breast cancer in their fifties. Jeanine’s mother’s sister was diagnosed with breast cancer in her thirties; she was treated and survived.

These histories, often taken before a patient is symptomatic or worried, allow the clinician to develop a risk profile. A conversation naturally ensues from this information:

Dr. M.: There is a lot of breast cancer in your family. What does that mean to you?

Jeanine: It concerns me a lot. When my mother was first diagnosed, she was only 42, and after the surgery they thought they got it all. But, 8 years later the cancer returned and they tried everything, including chemotherapy. It was horrible.

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Dr. M.: Horrible?

Jeanine: She lost her hair, lost a lot of weight, and had all these sores in her mouth. She was pretty miserable.

Dr. M.: I imagine you don't want the same thing to happen to you.

Jeanine: I think that's unlikely. Since the time I was born, everyone has said I look more like my father, so it has always seemed to me that I would not inherit this problem of my mother's.

A few simple exploratory questions will often reveal a wealth of information about what the illness means to the patient. Clinicians need to be wary of making assumptions. Each patient will have a unique and idiosyncratic understanding of the implications of genetically linked disease based on his or her own personal background, experience, education, personality, and disposition. In this particular case, the patient, although concerned, was convinced that because she did not look like her mother she was unlikely to have an inherited genetic predisposition toward breast cancer. As a result, she was disinclined to perform any increased surveillance activities and found the thought of earlier mammograms or breast self-exams at odds with her self-image.

The physician realized that Jeanine's belief could be based on misinformation; it also could be hopeful denial. Either way, education was needed to help Jeanine accurately evaluate her statistical or calculated risk, as opposed to her perceived risk, and commit to basic surveillance activities. Large discrepancies between perceived risk and calculated risk can lead to decisions based more on emotional precedent than scientific rationale. Part of family-oriented primary care practice involves negotiating a plan based on science that takes the patient's and the family's health beliefs and emotional context into account.

Another strategy for understanding how patients think about their risk is to ask family members for their thoughts about the family illness history. If they are not present, ask the patient what he or she knows about how others in the family think.

Dr. M: What does your husband think about your risk for breast cancer?

Jeanine: He never met my mother, but agrees from the pictures that I don't look much like her. I have talked to him quite a bit about how the illness and how her death affected me.

Family-oriented questions can illuminate the meaning of the illness in the family. This woman has constructed a potentially problematic way to cope with the possibility of her increased risk. Her husband is involved and plays a role in helping his wife interpret the information and make her decisions. Research provides evidence that family members influence a patient's decisions and emotional response to genetic information (1,9). Family environment also influences risk modification behaviors (10).

Raising the possibility of genetic testing does not come without consequences. When a clinician introduces the possibility of a genetic test to a patient, the event necessarily brings the patient to a decision point. To most patients, this is not as simple as deciding whether to go along with the recommendation to have their cholesterol checked. Finding a mutation carries a different stigma, and more direct concern about morbidity and mortality. Just considering the possibility can frighten some patients and their families. Some have concerns about maintaining insurance coverage. This all means that the clinician must seriously consider the consequences of raising the possibility of genetic testing. One important issue to consider when bringing up genetic testing is whether preventive or treatment measures exist if a mutation is discovered.

John Rolland has identified three phases for people who test positive for genetic mutation, but are yet to be symptomatic: a *precrisis phase*, a *crisis phase*, and a *chronic phase*. The *precrisis phase* is the time when the patient is blissfully ignorant of the possibilities. The *crisis phase* begins after the possibility of genetic testing has been raised and extends through an acute period after a mutation has been discovered. The *chronic phase* then begins and extends until the time symptoms develop. Each individual and family will handle each phase differently. (11)

In Jeanine's case, the clinician's exploration did not reveal any knowledge of BRCA 1 and 2 testing, so the clinician has to decide if, when, and how to raise the topic.

Dr. M.: To what extent are you aware of the recommendations for women in your situation?

Jeanine: Well, I sometimes do breast exams, and my previous doctor talked to me about getting a mammogram, but I was very busy, and then we moved, and I just never got around to it. I think I should probably get a baseline.

D. M.: That's a good idea and I'd be happy to arrange it. I do encourage all women to do regular monthly breast exams and I'm glad to hear you do them, at least some of the time. I also want to mention the possibility of genetic testing. It's not a standard recommendation, but I thought that you might have heard about it?

Jeanine: Yes, I had a friend who knew of someone who had it done.

Dr. M.: It's complicated and I can give you some more information about it to take home. I think you should probably talk to your husband about it, too. There are several genetic mutations that are associated with breast cancer. There is a blood test that looks for these mutations that can be passed on in families. If the mutation is present, those women have a higher likelihood of getting breast cancer than women who do not have the mutation. You should also know that if you don't have the mutation it does not necessarily mean you won't get breast cancer. It is recommended that someone in the family who has had breast cancer be tested for the mutation first.

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Jeanine: Really?

Dr. M.: Has anyone in your family had the testing done?

Jeanine: I don't think so. My aunt mentioned something about testing once, but I'm pretty sure she never had the test.

Dr. M.: If you like, I can give you some information on it and we could talk some more, say in a month. The test is expensive, somewhere close to several thousand dollars. If you wish, we could enroll you in a research study at the University where the test will be free and the process comprehensive and standardized.

Jeanine: Okay.

For many patients, the decision to have genetic testing is one that takes place over time. They need to absorb the information and become educated about what the test does and does not reveal about risk. The limits and expense of the test(s) need to be discussed in detail. For some, this process may take years.

There are some situations in which the clinician may decide to put off the discussion of genetic testing (e.g., with children or because a patient is under severe stress of some other kind and the delay is unlikely to affect outcome). For their part, patients refuse the test because there is no treatment currently available. Huntington's disease is such a disorder. In situations where no treatment is known, the advantage to testing is psychosocial rather than biomedical. A patient may wish to have testing in order to deal with anticipatory anxiety, plan whether or not to have children, or how to organize family finances. These circumstances are difficult and may benefit from collaborative care with a family therapist. The burden of knowledge of a mutation must be weighed against the ongoing worry over the ambiguity of the situation for the patient and the family.

Dr. T. saw Joe at age 38 for the first time, after his mother was diagnosed with Huntington's disease. His mother's sister and brother each had the disease and the family realized that was probably the case with their grandmother as well (see Fig. 17.1). Both Joe and Jill, his wife, were worried. Joe had a tremor in his hand that had developed over the past several years. Jill followed Dr. T. down the hall while Joe undressed for the exam and told him that Joe had been having memory lapses for the past year or so. She was so worried that this was a sign of Huntington disease that she did not tell her husband after the first several episodes. Dr. T. had helped this couple adopt two children when they were unable to conceive themselves. Jill mentioned how relieved she was that their children could not have the illness. She said she found herself paying careful attention to their financial situation and mentally assuming that she would have to make decisions about their young children's college, for example, by herself. Dr. T. realized in talking to these patients individually that anxiety over this anticipated illness was driving a wedge between this previously close couple. He suggested the couple see one of his family therapy colleagues, and they both agreed (see Fig. 17.1).

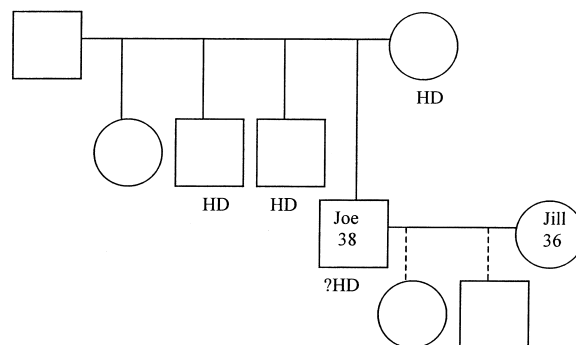


FIGURE 17.1. A couple facing Huntington disease.

Huntington disease is a single gene, dominant disorder. Penetrance for the gene is 100%, so if one has the mutation and lives to middle age, that person will almost certainly get the disease. Still, exactly when and how the disease will unfold is unknown. More common, multifactorial genetic disorders are ambiguous, complex, and riddled with the potential for misunderstanding. The clinician must be especially wary of genetic determinism (e.g., “If you have the gene then you get the disease; if you do not have the gene then you do not get the disease”) with multifactorial disorders. In these circumstances, patients can misunderstand and exaggerate the implications of genetic testing, not understanding that environmental or behavioral factors (e.g., diet, stress, or exercise) may play a role in the final expression of the disease. In any case, it is important to help each person feel a sense of agency about what he or she does have control over and work toward acceptance of what he or she does not. A person may be able to alter their environment, diet, or exercise behavior. They may seek preemptive treatment (e.g., having prophylactic bilateral mastectomies or taking tamoxifen before breast cancer is diagnosed) if they have a genetic mutation.

With multifactorial disorders, patients may overestimate the contribution of genetics to their overall risk profile. Prior to genetic education, they may believe they have a significant family history when in fact they do not. For example, a relative dying of a cancer of any type may be perceived by a patient as increasing his or her risk for *all* cancers. Primary care clinicians can make a significant contribution by providing education and reassurance, and avoiding unnecessary anxiety and referral. Primary care clinicians need to educate themselves about the nuances of genetic screening and testing (12). Clinicians need to know which illnesses have a genetic connection (see Table 17.1) (13), what tests are available, and which diseases can be affected by advance knowledge. In one study (14), GPs in England tended to overestimate genetic risk. These physicians acknowledged the dif-

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TABLE 17.1. Common disorders with significant genetic components

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*Single Gene Disorders*

Cystic fibrosis  
Huntington's  
Sickle Cell  
Thalassemia  
G6PD deficiency  
Hemochromatosis  
Hemophilia  
Hypercholesterolemia  
Neurofibromatosis

*Multifactorial Disorders*

Alzheimers  
Asthma  
Blood clot or pulmonary embolism  
Cancers  
Coronary artery disease or myocardial infarction before age 60  
Depression  
Diabetes  
Essential hypertension

*Multifactorial Conditions*

Diabetes  
Asthma  
Epilepsy  
Alcoholism or drug abuse  
Birth defects  
Mental retardation  
Suicide

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Adapted and expanded from reference 16. Used with permission.

difficulty in calculating and communicating risk to patients, and as a result were disinclined to do it. A computerized risk assessment was proposed as a solution (see the Harvard Cancer Risk, University of Texas Southwestern Medical Center CancerGene, and Cambridge University Family Genetic Web sites).

### Preparing the Patient with Information: Pretest Counseling

Once the primary care clinician has screened the patient and the decision has been made to proceed with genetic testing, the next step is to provide pretest counseling. In some cases, the reason for genetic testing is to further delineate the diagnosis (e.g., breast and colon cancer) and to guide future treatment. In other cases, the purpose of testing may be to identify carrier



states. In all instances, appropriate pretest counseling must precede genetic testing. For patients living in an urban area with a strong family history and knowledge of the genetic illness, initial counseling regarding genetic screening may occur with a genetic counselor.<sup>1</sup> For most patients, some pretest counseling will first occur in a primary care clinician's office. For example, in providing routine prenatal genetic counseling to a couple who is not at increased risk (e.g., Bill and Sandy) the clinician may first wish to establish the usefulness of the information to the couple.

Dr. C.: There are several rare, but serious, conditions for which we can screen in pregnancy. These problems can cause mental retardation, paralysis, shortened lifespan, and even the death of your baby. These problems include Down's syndrome, cystic fibrosis, and neural tube defects. I can explain each to you, if you'd like. But first, it's helpful for me to know ahead of time whether you would consider terminating your pregnancy if your baby had one of these conditions?

Some couples who do not want to terminate their pregnancies under any circumstances may still want testing and information. In these cases, it is important to provide patients with pamphlets and written information about the disorder. It is also worth saying:

Dr. C.: Some parents are interested in knowing whether their baby has one of these conditions, even if they would not choose to terminate the pregnancy. Something medical can sometimes be done to improve the outcome.

Although it usually does not require extensive discussion, prenatal genetic counseling is too often rushed with comments like, "this is just a routine test." For example, a newly pregnant couple may ask a question about the purpose of maternal serum  $\alpha$ -fetoprotein testing. If the test is negative, the clinician may manage with a "routine test" comment; however, this comment is clearly problematic when it becomes necessary to explain an abnormal test result. All patients deserve to be educated about any genetic test that is proposed for them.

Explaining the limits and capabilities of the testing process to patients can be challenging. Many patients are understandably reluctant to learn the details of false positives and false negatives, pretest probability, and variable penetrance. Clinicians may be reluctant to take the time to explain these complex concepts; however, now that the National Institutes of Health, American College of Obstetrics and Gynecologists, and American College of Medical Genetics recommend offering cystic fibrosis (CF)

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<sup>1</sup> The names of certified genetics counselors may be found at [www.nsgc.org](http://www.nsgc.org).

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testing to all Caucasians who are pregnant or considering conception, clinicians are required to describe at least the basics of these concepts.

David and Alice had been living together for 3 years and had talked about having children, but did not feel quite ready. It came as a surprise when Alice's pregnancy test was positive, but the couple was happy nonetheless. They had several friends with healthy young children and had little idea what could possibly go wrong. When their clinician offered prenatal testing for cystic fibrosis at the first visit, they were shocked out of their idyllic dream of parenthood into the sober reality that something could go awry. They discovered they had quite different approaches to this stress. Alice was a "come what may" kind of person, whereas David was much more interested in information and the potential for changing a situation that was unacceptable to him. To complicate matters, Alice had a cousin with CF. In addition, the physician himself was ambivalent about the new testing guidelines. He thought the test was of low utility and unnecessarily worried parents. Explaining the test took time out of his busy schedule. His mixed feelings were communicated to David and Alice and increased their conflict. Consultation with colleagues, and a Web-based CME course, allowed this physician to help this couple understand more clearly and decide about testing in their next visit.

A difficult public health lesson was learned from sickle cell screening in the 1960s when adequate pre- and posttest counseling was not accomplished. This is a particular risk with generalized population screening. A well-intentioned push for universal screening for sickle cell anemia, fueled by tremendous excitement for the new simple technology, brought sickle cell testing to every African-American community. Virtually no pretest counseling was done, unfortunately, with little more than a short pamphlet provided. It was assumed that people who were tested would be able to understand the difference between sickle cell trait and sickle cell disease, and that many who were positive for the trait, but did not have the disease, were left desperately confused by not understanding this important difference.

The test for Tay-Sachs was developed shortly thereafter, and because of the mistakes with sickle cell testing, a concerted and extensive effort was made to ensure that adequate pretest counseling was done. Before the test was carried out, people had to demonstrate comprehension of the meaning and implications of the test. The results of this testing process were much more satisfying, with a dramatic reduction in the amount of misunderstanding that took place. The history of testing within different ethnic groups may influence the response of any given patient to the suggestion of genetic testing. In addition to cultural factors, family response can have a powerful influence on the patient's decision and experience of genetic testing. In the pretest counseling visit, it is important to ask patients to predict what their own and others' response will be to test results, whereas

understanding it may be a different story when the actual result arrives. Emotions are hard to predict and the intensity is usually greater than anticipated. Genetic testing may stimulate a poignant existential awareness, and the clinician must be prepared to witness these strong sentiments in patients and family members (see Table 17.2 for the important elements involved in pretest counseling).

Genetic testing centers traditionally provide sophisticated pretest counseling. As testing becomes commonplace, however, more and more of this may occur in the primary care clinician's office, which is not unlike HIV testing. Even when the actual genetic testing takes place outside the primary care clinician's office, patients can benefit from the advance education and preparation given by the primary care clinician. Some patients may need encouragement to write down questions to bring to the genetics counselor. Taking along a family member or friend who is not biologically implicated is recommended. These companions will often remember details that the patient may not because they are less overwhelmed by the emotion of the experience.

Education about the process promotes realistic expectations and can reduce anxiety. For example, it may be helpful for patients to know that genetic testing centers usually send out an extensive precounseling questionnaire, and that the first visit takes 1–2 hours. It is rare to have testing done at that first visit (unless prenatal), and there is usually only one posttest visit. Prior to entering the testing process, patients may want to review their life and disability insurance. Multiple studies across various illnesses now show that the psychological risk posed by most genetic testing is not great (15). Collaborative care with a family therapist, however, is important early in the process for individuals or families with a history of affective disorder or other emotional or relational difficulties, or for those with an unusual amount of anxiety or ambivalence about the testing.

All results come to the patient in writing, but not necessarily to the primary care clinician, so it is important to gain patient permission to estab-

TABLE 17.2. Elements of primary care pretest genetic counseling

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- Provide an explanation of false positives, false negatives, inconclusive results, and general probabilities.
  - Explain the implications of a positive test result.
  - Describe the potential benefits, risks, and limitations of testing.
  - Ask the patient to make a prediction of how he or she will feel about positive or negative results.
  - Ask the patient to make a prediction of what he or she will do depending on the results of the test, listening carefully for problematic blame and guilt.
  - Ask who the patient intends to tell the results and ask for predictions about how they will react.
  - Discuss confidentiality and its potential limits.
  - Review alternatives to testing.
  - Assess the coping styles of the patient and the family system.
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lish professional lines of communication early in the process. Individuals found to be at increased risk, even if they ultimately choose not to proceed with testing, should be encouraged to enroll in clinical research programs where they are most likely to get state-of-the-art care that is frequently free.

To return to the Murphy case, Jeanine brought Al in to see Dr. M. to discuss further whether she should proceed with BRCA testing.

Dr. M.: Hello Al, good to meet you. Your being here is a nice support to Jeanine.

Al: Thank you. I love Jeanine and this seems pretty important.

Dr. M.: Have you all had enough time to read through the materials that I gave you?

Jeanine: Yes, thank you, they were very informative. We also found some good stuff on the Internet. I didn't realize how controversial this is.

Dr. M.: Maybe we should begin by you telling me what you have learned so far?

Jeanine did most of the talking, but Al was clearly very involved, holding her hand, nodding, and adding various clarifications for emphasis. The imprecision of the testing, the persistence of considerable ambiguity, and the possibility of inconclusive results irritated them. They were also worried about upsetting Jeanine's aunt by asking her to take the test first.

Dr. M.: You two have done an impressive job of research and frankly I feel you know about as much as I do about the testing. If you like, I can direct you to some other educational resources, including the University genetic testing center. How would you like to proceed?

Jeanine (looks at Al): I think we have pretty much decided to go ahead with testing. It sounds like the University is the place to go.

Dr. M.: It is. Let me tell you about how the whole process works, and I'll give you my routine advice about how to get the most out of seeing a specialist. You probably have thought about most of this already, but I want to be sure I do everything I can to be helpful. We can talk about approaching your aunt, and I should also ask about your siblings.

The pretest counseling phase is often when family members become more involved: spouses for support and extended family members to gain information about their own risk. Patterns of family rules and boundaries, along with personal beliefs about sharing medical information, will heavily influence this process. For example, some people still prefer not to disclose a history of mental illness or cancer. There may be considerable diversity in the way various family members cope with the need to know and the dispersal of information. Confidentiality in these contacts can be a delicate balance between the pursuit of reliable information and respecting the identified patient's need for privacy and autonomy. Patients in the United States have the right to confidentiality with any genetic testing. In a random survey of the populace, the vast majority (97%) stated they want to inform at-risk family members, especially when the disease may be preventable;

however, a very small number (18%) believe that physicians should inform at-risk family members against a patient's wishes (16). From the legal perspective, the clinician's "duty to warn" potentially affected family members has not fully been developed in the U.S. legal systems. Legal experts and medical ethicists debate the individual right to privacy versus the family member's right to knowledge about their own risk (ASHG Social Issues Subcommittee on Familial Disclosure) (17).

Anticipating disclosure issues should be part of pretest counseling. Whether done by a primary care clinician or a collaborating family therapist, it can take a considerable amount of coaching and discussion to decide who in the family will be involved and how any test results will be communicated. Part of pretest counseling is anticipating whom the patient will tell, and who might be affected and want to know.

Kathy had breast cancer at age 28, just after the birth of her second child. Given her young age, Kathy decided to undergo genetic testing and found that she did have the BRCA1 mutation. This result shocked both her and her husband, and they decided to take a year to adjust before telling her extended family. Toward the end of that time, her first cousin was diagnosed with breast cancer. Kathy immediately told her cousin of her own test results. The cousin was infuriated, blaming Kathy for her cancer, and saying that if she had known perhaps she could have undergone some preventive procedures. This was unlikely given the time frame but the tension created in the family from lack of disclosure led Kathy to write a long and descriptive letter that she photocopied and sent to every family member of whom she knew.

Some physicians advocate that a family meeting be held to negotiate a "family covenant" when faced with a patient who plans to undergo genetic screening/testing (18). With the patient's agreement, this covenant allows the clinician to facilitate discussion about which family members wish to be informed about test results, and which opt out, before any screening is undertaken. The covenant is then placed in the patient's chart.

## Posttest Counseling

Most test results will be delivered at a genetic testing center in tertiary care; however, those primary care clinicians who order testing are responsible for delivering test information. This section will discuss the elements of primary care posttest counseling. Even for those patients who receive the news at a testing center, some aspects of this conversation may occur at follow up soon after in primary care. Anticipating the results of genetic testing tries the patience of every patient and their family. The experience is often loaded with anxiety, trepidation, and expectation. Many variations of the anticipated conversation will have been mentally rehearsed prior to

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the visit. From the moment the patient arrives, he or she will be searching for clues about the result. From the receptionist, to the nurse, to the moment the clinician walks in the room, the patient wonders who knows the news. Given the anticipation, a short greeting, and perhaps a brief introduction is all that is necessary before delivering the news.

Francisca and Julio Jiminez arrived for the posttest counseling visit frazzled and at their wit's end. Dealing with traffic and parking had been difficult and Julio was disturbed by what he thought was Francisca's strange complacency. She was certain that she would be positive for one of the BRCA mutations and this did not seem to bother her. Julio was desperately afraid of losing her and could not understand why she was not more nervous.

Dr. S. (smiling): Francisca . . . Julio, nice to see you.

Francisca and Julio (together): Good to see you, too.

Dr. S: I have good news. The test was normal. There is no evidence for any mutation.

Julio (beaming): Oh, thank you, God!

Francisca (stunned and speaking slowly): Are you certain?

Dr. S. (puzzled): Yes, I'm quite certain. As we discussed previously, this does not necessarily mean that you will not get breast cancer. We should still do the standard screening for someone with the high-risk family history you have.

Julio: I am so happy. Thank you, doctor.

Francisca (looking down and away): I . . . I . . . don't what to say.

Dr. S. (concerned): Francisca, you seem pretty stunned by the news and I'm guessing that maybe you were expecting something different?

Francisca: I was certain I would be positive for the mutation. My mother had breast cancer and was found to have the mutation, my aunt had breast cancer, and one of my sisters has already had breast cancer. I have thought for years that I would eventually get the disease, sooner rather than later, and have lived my life with that expectation. I guess I still feel that way. . . am certain of it. . . and I guess the result really doesn't change my thinking about this. (long pause) I would still like to go ahead with a mastectomy. I was thinking that being positive for the mutation would just make my decision easier on everyone else.

Even a negative test that brings apparent good news can be stressful to a vulnerable patient. The clinician must be sensitive to each individual's perspective and mindset. In this particular case, because of family history, Francisca had organized her self-concept around the notion that she was eventually going to get breast cancer. Her expectation was that the test would confirm her belief. The negative result would seem to require a reorganization of her self-concept. Despite the findings, however, she still maintained her desire for mastectomy to minimize the chances of contracting breast cancer. In fact, if a women's family history is strongly positive for

breast cancer, being BRCA negative may only slightly decrease the likelihood that she will get breast cancer. Francisca wanted to get the test, more to help convince others of the sanity of her desire for prophylactic mastectomy, and not so much for her. The negative result ultimately did not alter her self-image, but it did leave her with less rationale to convince others, and it was about this that she was most distressed. Another example illustrates the role testing can play at times of developmental transition.

Dick and Kathy had been dating for 2 years and were engaged to be married in 6 months. Two of Kathy's sisters had been treated for breast cancer and the third one had just been diagnosed. Kathy had previously considered BRCA testing, but eventually called it off. Her previous boyfriend, Don, had become so anxious about the prospect of Kathy getting breast cancer that he left her. In contrast, Dick understood from the beginning about Kathy's risk profile and wanted to marry her, for better or worse. "We're all at risk for something," he said.

## Long-Term Follow Up

Because genetic testing centers typically offer a single posttest counseling visit, responsibility for long-term follow-up of patients falls to the primary care clinician. Because of this, primary care clinicians need to have good communication with testing centers. This means obtaining the results of genetic testing and asking to be informed as new technology and information becomes available. Most patients assume this communication will occur; however, some may be very concerned about the potential impact of having the results in the medical chart. Fears about insurance and job discrimination are widespread, although very few documented cases of discrimination have yet been reported.

In the long term, despite education during the acute testing phase, some patients do drift back to their previous perception of risk. In one study of women with family patterns of inherited breast cancer, the percentage of women with an accurate perception of their own risk went up after counseling to 31% from a baseline of 9%. One year later, the percentage of women with a correct assessment of their risk had dropped again by half, suggesting that in the absence of further counseling these women reverted to their old, inaccurate perceptions (19). As with any chronic illness, when the patient who tests positive is in the presymptomatic phase, the clinician needs to attend to the patient's changing perception and need for information, support, and guidance, even though no disease process is yet manifest. Continuity with the patient and the family will provide a continuously available resource that the patient and family can access as they need. Both the kind of help and the pace with which it is needed will vary from patient to patient, family to family, and illness to illness.



## Conclusion

Genetic screening, testing, and counseling for hereditary illness is the quintessential argument for a biopsychosocial paradigm encompassing the most basic units of biology to human behavior, family, society, and the environment. Complex legal and ethical consequences need to be considered. Early in the twenty-first century, we stand at the beginning of a long process of understanding genetic factors in illness and the mainstream application of this knowledge in primary care practice. Many scientific and psychosocial issues are not yet resolved. It is difficult to keep up with new tests as they become available. There is a lag between when genetic tests make the news and when they are available through local labs and hospitals. There is also an understandable fear that the time required for adequate communication will not be available. Even so, decoding the human genome and deriving clinical applications are underway and will have far-reaching effects. A streamlined and bidirectional flow of information from cutting-edge research to geneticists to primary care clinicians to patients and their families will ensure sensible application of this new health technology.

## References

1. Davidson ME, Weingarten K, Pollin TI, Wilson MA, Wilker N, & Hsu N, et al.: Consumer perspectives on genetic testing: Implications for building family-centered public policies. *Fam Syst Health* 2000;**18**(2):217–235.
2. McKusick VA: The anatomy of the human genome: a neo-vesalian basis for medicine in the 21st century. *JAMA* 2001;**286**:2289–2295.
3. Collins FS, Guttmacher AE: Genetics moves into the medical mainstream. *JAMA* 2001;**286**:2322–2324.
4. Meiser B, Halliday JL: What is the impact of genetic counseling in women at increased risk of developing hereditary breast cancer? A meta-analytic view. *Soc Sci Med* 2002;**54**:1463–1470.
5. Speice J, McDaniel SH, Rowley P, & Loader S: A family-oriented psychoeducation group for women who test positive for the BRCA1/2 mutations. *Clin Gen* 2002;**62**:121–127.
6. Cornfeld M, Miller S, Ross E, & Schneider D: Accuracy of cancer-risk assessment in primary care practice. *J Cancer Ed* 2001;**16**:92–97.
7. Bennett R: *The Practical Guide to the Genetic Family History*. New York: Wiley-Liss, 1999.
8. Rose P, Emery J: Assessment and management of genetic risk. In: *Oxford Textbook of Primary care*. Oxford, England: Oxford University Press, (In Press).
9. Coyne J, Anderson K: Marital status, marital satisfaction, and support processes among women at high risk for breast cancer. *J Fam Psychol* 1999;**13**:629–641.
10. Wyman PA, Cowen EL, Work WC, Hoyt-Myers L, & Magnus KB: Caregiving and developmental factors differentiating young at-risk urban children showing resilient versus stress-affected outcomes: a replication and extension. *Child Devel* 1999;**70**:645–659.



11. Rolland J: Families and genetic fate: a millennial challenge. In: McDaniel SH, Campbell TL (Eds): Special issue on genetic testing and the family. *Fam Syst Health* 1999;**17**(1):123–132.
12. Primary care Faculty Development: Family medicine, general internal medicine & general pediatrics. *Genetics in Primary care Training Program Curriculum Materials*. Washington DC, HRSA Contract #240-98-0020, 2001.
13. Acheson L: Managing genetic information in families, Society for Teachers of Family Medicine Annual Family in Family Medicine Meeting. San Diego, March 1, 2002.
14. Fry A, Campbell H, & Gudmundsdottir H, et al.: General practitioners views on their role in cancer genetics and current practice, *Fam Prac*.
15. Lerman C, Croyle RT, Tercyak K, & Hamann H: Genetic testing: Psychological aspects and implications. *J Clin Consult Psychol* 2002;**70**:784–797.
16. Lehmann LS, Weeks JC, Klar N, Biener L, & Garber JE: Disclosure of familial genetic information: perceptions of the duty to inform. *Am J Med* 2001;**109**: 705–711.
17. American Social of Human Genetics, Social Issues Subcommittee on Familial Disclosure: Professional disclosure of familial genetic information, 1999.
18. Doukas D, Berg J: The family covenant. *Am J Bioethics* 2001;**1**:3:2–10.
19. Emery J, Watson E, Rose P, & Andermann A: A systematic review of the literature exploring the role of primary care in genetic services. *Fam Prac* 1999;**16**(4):426–445.

## 302 17. Genetic Screening, Testing, and Families

## Protocol

*Raising the Possibility: Risk Assessment and Genetic Screening* (Primary Care Clinician)

- Use genogram to track hereditary illnesses.
- Understand the meaning of the illness to the patient.
- If interested or concerned, encourage the patient to gather information about the disease and the test.
- Invite the patient to bring a significant other or other family members to discuss possibility of genetic testing.
- If appropriate, refer to a tertiary-care genetic testing center.

*Preparing the Patient with Information: Pretest Counseling* (Primary Care Clinician or Genetics Counselor, Mental Health Professional Also Occasionally Needed)

- Explain false positives, false negatives, and inconclusive tests and specific details of how these concepts apply to the testing under consideration.
- Understand how these concepts apply in the individual's context (i.e., pretest probability and positive predictive value of a test).
- Discuss the implications of a positive test.
- Discuss the potential benefits, risks, and limitations of testing.
- Ask patients to predict, as much as possible, how they will feel about the results of the test.
- Ask patients to predict, as much as possible, what they will do depending on the results of the test. Listen carefully for problematic issues of blame and guilt.
- Ask patients who will be told about the results and to speculate about how these people will react.
- Discuss confidentiality and its potential limits.
- Review alternatives to testing.
- Schedule for testing if patient decides to follow through.

*Posttest Counseling* (Primary Care Clinician Or Genetics Counselor, Mental Health Professional Also Occasionally Needed)

- Deliver results in writing.
- Have patient accompanied by a significant other that is not at risk.
- Give patient a full explanation of results in writing.
- Provide emotional support.

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- Discuss alternatives directed toward early detection and/or prevention.
- Provide information concerning testing of other family members.
- Assess how the patient and family are coping with the information.
- If positive for a mutation, refer to relevant specialists, including mental health.
- If positive, check in a few days later by phone.

### *Long-Term Follow Up (Primary Care Clinician)*

- Review results again. If relevant, review report from testing center. Provide updated information.
- Discuss the meaning of the illness and the results to the patient, partner, and family.

## Appendix 1: Selected Genetic Testing Web Sites

American Medical Association: [www.ama-assn.org](http://www.ama-assn.org)

Centers for Disease Control: [www.cdc.gov/genetics](http://www.cdc.gov/genetics)

National Newborn Screening and Genetics Resource Center: [genes-r-us.uthscsa.edu](http://genes-r-us.uthscsa.edu). Contains Genetics in Primary Care Curriculum and web links.

National Institutes of Health: [www.nih.gov](http://www.nih.gov)

Genetic Alliance: [www.geneticalliance.org](http://www.geneticalliance.org). An international coalition of individuals, professionals, and genetic support organizations that work together to enhance the lives of people affected by genetic conditions.

The Genetic Resource Center: [www.pitt.edu/~edugene/resource/](http://www.pitt.edu/~edugene/resource/). An online resource for genetic counseling information.

Gene Clinics: [www.geneclinics.org](http://www.geneclinics.org). A clinical information resource that relates genetic testing to diagnosis, management, and counseling for inherited disorders.

Gene Tests: [www.genetests.org](http://www.genetests.org). A genetic testing resource funded by the National Library of Medicine. Includes an introduction to genetic counseling and testing concepts.

The Genome Action Coalition: [www.tgac.org](http://www.tgac.org). Comprised of patient advocacy, professional, research, pharmaceutical, and biotechnology organizations and companies that come together to promote genome research.

National Coalition for Health Professional Education in Genetics: [www.nchpeg.org](http://www.nchpeg.org). Promotes health professional education and access to information about advances in human genetics to all health professionals.

National Center For Biotechnology Information: [www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov). Lists hereditary conditions.

National Society of Genetic Counselors, Inc.: [www.nsgc.org](http://www.nsgc.org). Lists genetic counselors.

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