



GENETIC MEDICINE IN THE NEXT FIVE YEARS

Even for many healthcare professionals, the work of the Human Genome Project (HGP) sometimes seems more like science fiction than science. But the work is real enough, and it will very soon be having an impact on a wide range of Health Progress readers, including executives of healthcare organizations, physicians, and mission directors.

With that thought in mind, we asked Alan E. Guttmacher, MD, to talk to us about some of the more practical aspects of the new genetic medicine. Dr. Guttmacher is senior adviser to the director for clinical affairs, National Human Genome Research Institute, National Institutes of Health, Bethesda, MD.

What practical questions about the HGP and genetic medicine should hospital CEOs be thinking about today?

The main thing is that we have a window of opportunity. We're beginning to understand how genetics is going to fundamentally change medicine, though it hasn't done so yet. We should prepare ourselves for that change now.

I think we can expect several different developments in the next five years. First, we'll see some new therapies based on the new understanding of basic biology that genetics will afford us. This will be especially true of some of the common diseases. Whereas medical research on genes in the past tended to focus on relatively rare conditions—for example, Marfan's syndrome, cystic fibrosis, Turner's syndrome, or Down's syndrome—the new targets are more common problems: atherosclerosis, Alzheimer's disease, diabetes, and, most important, cancer. And these are, of course, the diseases that put the most people in hospitals.

What about physicians—especially family doctors, internists, pediatricians—who see pa-

*An
Interview
with
Dr. Alan
Guttmacher
of the
Human
Genome
Project*

tients every day? What should they expect to see in the next few years?

Almost any primary care physician will tell you patients are *already* bringing in newspaper articles or stories from the TV news about genetic medicine and common problems like, say, diabetes. And they want the physician to explain what all this means and how it might affect them.

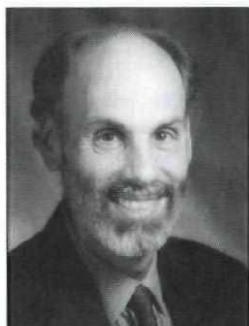
This is very new. In fact, it just started happening in the past year or so. Until now, a good primary care provider had little need to know much about genetics. He or she would occasionally see a patient with a genetic condition of some sort, and would usually refer the patient to a medical geneticist or a genetic counselor. There's going to be a huge change here, and it will occur soon.

By the year 2004, the typical primary care physician will no more be able to practice medicine without thinking genetically than he or she can practice today without knowing about infectious diseases. What if you took your child to the pediatrician because of an earache, and he looked in the kid's ear and said, "My gosh, he's got an infection there—I think you'd better take him to an infectious disease specialist"? You'd ask yourself, Why am I bothering with this guy? Why don't I just go to the specialist in the first place? Well, it's going to be the same with genetics in a relatively few years.

Almost every patient will have some concern for which genetics will offer some help. The primary care physician will need to be able not just to refer that patient, but to actually provide care for the patient.

Could you say more about genetic medicine and treatment of some of the more common illnesses?

Let me give you a couple of examples. One would be hemochromatosis, sometimes known as



Alan E. Guttmacher, MD

“iron overload disease,” a genetic disorder we’ve known about for years. It’s a condition in which, because of a genetic mutation, certain people maintain their iron stores too well. They absorb iron like everyone else, but they don’t get rid of it. Hemochromatosis

tends to affect men more severely than women; because women bear children and have regular menses, they have less trouble getting rid of iron.

The condition is less common in other people, but among caucasians, one person out of every few hundred has hemochromatosis—and it’s usually undiagnosed until the end stages, which can include diabetes and cirrhosis. It can cause death at an early age.

Hemochromatosis is common enough that health policymakers are talking about doing population-based screening for it. Screening would be relatively inexpensive. And the great thing is that, if you can diagnose the disease early enough, before it’s clinically manifest, treatment is truly easy: simple phlebotomy. The person has blood taken off at regular intervals, and that reduces his iron store.

The trick is in diagnosing the illness, which is where genetic medicine comes into play. Physicians should start learning about the condition now because they can now order a hemochromatosis gene panel as part of a blood workup.

Another example is breast cancer. We already know a good deal about the genetic basis of this disease. One out of every couple hundred women has an inherited predisposition for it. Today a physician who has a patient with a strong family history of breast cancer can refer her to a local genetics center. Sometimes there are real benefits from trying to identify a specific gene at work in the family. This can be a long, complicated process, but it can also be literally lifesaving.

Are there articles or books you recommend that physicians and hospital CEOs should read to prepare themselves for the coming of genetic medicine?

To start with, they ought to go on reading the kind of articles they’re probably reading now. It’s almost impossible these days to get through an issue of *JAMA* or the *New England Journal of Medicine* or the other leading medical journals without coming across something to do with

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genetics. Unfortunately, most practitioners today graduated from medical school before such schools had genetics courses. I for one graduated from a reputable medical school without having a single course in genetics—and I’m not that old.

There’s an umbrella organization called the National Coalition for Health Professional Education in Genetics (NCHPEG) that is looking for ways to educate healthcare providers—not just students but people already practicing medicine—about genetics. NCHPEG, which is about two years old now, can offer a good deal of pertinent information to primary care providers. Providers can also look to their own organizations for genetics information—to, for instance, the American Medical Association, which is one of NCHPEG’s major backers, the American Academy of Pediatrics, the American Academy of Family Practice, and others like them.

These professional societies are more aware than they were a few years ago of the need for genetic education. The average physician should probably make use of one of the continuing education programs these societies offer, rather than trying to educate himself or herself from a textbook, which is difficult for a busy provider to do.

Please say something about the Ethical, Legal and Social Issues (ELSI) program and the kind of questions it deals with.

That’s a good question, particularly for healthcare providers, because people look to us for leadership on these issues, and also because we’re going to be coming up against the issues in our day-to-day work much more often than nonmedical people will do.

The founders of the HGP, realizing at the very start that huge ethical issues would emerge from it, determined to set aside approximately 5 percent of all the funds that went into the project to look at ethical, legal, and social issues. They believed that the ethical implications were so important that they shouldn’t be left to scientists alone, that there should be a larger societal dialogue about them.

One of the things the ELSI program looks into, for example, is the privacy issue. Should there be a right to genetic privacy? Should knowledge about a person’s genetic makeup, as it makes its way into his or her medical records, be available to family members? To neighbors? To the person himself or herself?

Much of this information will tell us about our disease *predispositions*, well before we actually develop the disease. What about knowing, 30 years before you actually develop some illness, that you inherently have a significantly increased



risk for that condition? How does that change the way you look at yourself? Will it change the way your employer looks at you? The way your healthcare insurer looks at you?

Those kinds of questions are among the many—the myriad of ethical questions, actually—that will come out of the HGP.

Returning to the privacy issue for a moment: How can people protect themselves against adverse results from genetic testing?

About two dozen states have already adopted laws limiting access by employers and health insurers to genetic information. Several similar bills are under consideration at the federal level.

Of course, there's been a lot of discussion in recent years about medical confidentiality in general, and some people would argue that genetic medical information is really no different from other kinds. Others think that genetic information requires a higher level of security. This is perhaps an area where good people can agree to disagree.

But however we decide to address the issue, we need to address it pretty quickly. Because if we *don't* address it, the very understandable human concern about possible invasion of privacy is likely to keep many of genetic medicine's benefits from being utilized. And that would be very unfortunate for everyone.

Isn't genetic medicine going to be very expensive? How is society going to pay for it? Will it mainly benefit wealthy people?

Let's take the question of expense first. There are ways, in fact, that genetic medicine should *lower* the cost of healthcare. Here's one example.

One of the great things about genetic medicine is that we'll be able to find out a person's individualized disease predisposition long before he or she becomes ill. As we know, preserving health is often cheaper than treating illness.

But this also means that we'll be able to develop more rational screening strategies. Organized medicine has not been able to decide whether a woman in her forties should have yearly mammography or not, because it depends on the individual woman. For some women it's probably a waste of healthcare dollars—not to speak of the cost in time and unnecessary anxiety. Other women should probably start having mammograms in their thirties. A lot of this—not all, but a lot—has to do with a given woman's individualized genetic predisposition for breast cancer. The new genetic medicine will allow us to quantify to some degree that woman's predisposition. And that will make possible a more rational use of healthcare dollars, enabling us to spend more on

mammography for women with a high rate of risk for breast cancer and less on women at low risk.

So some of the new genetic medicine will actually wind up saving society money.

You also ask who is going to have access to the new medicine? I think education may be more important than wealth in this respect. Particularly in the next few years, until the new genetics becomes an institutional part of healthcare, well-educated people are likely to be more knowledgeable about the new medicine and—because they know more about it—more aggressive in seeking benefits from it than people with less education.

This is a major challenge that we in medicine have to face. In some ways, I think, the new genetics will be a completely new medical discipline. For the first time in years, medicine has an opportunity to try to overcome some of the traditional barriers to access. But this is going to be a tough challenge. It's one more reason to educate primary care providers, so that *all* providers—not just those taking care of wealthier, better-educated patients—will be able to apply genetic medicine to their patients.

A recent magazine article (Ellen Licking, "Gene Therapy: One Family's Story," *Business Week*, July 12, 1999) described researchers' efforts to understand a genetic illness called Fanconi's anemia. On one hand, everyone wants to find a cure for the disease, which targets children and is nearly always fatal. On the other hand, the condition is rare. Should we be spending our research dollars on problems like Fanconi's anemia—or, instead, on illnesses that afflict many more people? How can we arrive at a *just* use of genetic medicine?

First of all, I hope it will be society at large—rather than an individual researcher or physician—that makes those decisions. But I don't think it's necessarily an either/or proposition. A truly just society meets both of those kinds of needs.

But let's talk for a moment about Fanconi's anemia, a disease that affects relatively few people. One of the wonderful results of the HGP is a much more fundamental understanding of human biology than we've ever had before. This means that, in searching for a cure for Fanconi's anemia, we will learn things about the ways bone marrow works and about the way blood cells are produced. And this new knowledge will perhaps change not only the treatment of that deadly illness but also the treatment of many other anemias, including those that are much more common.

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We've already seen results like this in the study of breast cancer. Some genes have been identified that affect a relatively small proportion of women—maybe 5 to 15 percent—who develop the illness. But by coming to understand the genetic mechanisms involved in that small number, we are coming to understand the way *all* breast cancers occur. Actually, this is something scientists have known for centuries: Studying unusual phenomena can lead to a fuller understanding of the more usual ones.

How can a faith-based organization like the Catholic Health Association help prepare its members for what lies ahead? How, especially, can we contribute constructively to discussion of the ethical issues involved?

In our society, individuals historically look to faith-based organizations for discussions of ethical issues. The ELSI program has sponsored a number of meetings on ethical issues. I organized one in Vermont, in which leaders of various religious faiths came together for several days to talk about the ethical implications of the new genetics.

Maybe the most important thing faith-based organizations can do right now is to let people know that this is a group of issues *they* should have some real impact on. We read in news magazines about things like cloning and Dolly, for example, but many other issues are much more pertinent to the average person's daily life. It would be wonderful to have faith-based organizations involved in—perhaps even *leading*—those conversations.

—Gordon Burnside

☎ For further discussion of these issues, contact Ron Hamel, CHA senior associate, ethics, 314-253-3563. More information can be found at Web sites of the National Human Genome Research Institute (www.nhgri.nih.gov) and the National Coalition for Health Professional Education in Genetics (www.nchpeg.org).

ETHICAL ISSUES IN GENETICS

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Genetic tests and therapies raise a social justice issue.

this approach to medicine will also emphasize some sort of national health insurance so that all receive important, preventive interventions early in life.

The growing possibility of practical application of genetic tests and therapies raises a key issue of social justice: Should we continue to emphasize forms of medical intervention—for example, gene therapy—that are very expensive and that will benefit a very few, or should we begin to shift our resources toward interventions that will benefit the majority—for example, the immunization of all children, or nursing care for the elderly? Such a shift will require prolonged national discussion. But the path we are going down, in my judgment, can no longer be sustained. More and more money is being spent on the care of a smaller number of people, and on research for diseases that affect relatively few. While no one should be denied reasonable healthcare, we need to consider carefully how modern genetics fits into the definition of reasonable healthcare and how such a resolution will affect the healthcare needs of all. □

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