Geneticization and Medical Education: A Pilot Study

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Abstract

The role of the physician in providing basic genetic medicine is growing. There is fear that, within this trend, physicians will geneticize medicine by adopting deterministic and discriminatory attitudes linked to genetics. A quantitative survey of 600 physicians practicing in Ohio employing the Genetic Determinism Instrument, the Genetic Relativism Scale, and the Genetic Discrimination Scale was administered. 585 physicians were determined to be eligible for the study and, of these, 66 (11.3%) returned completed surveys. Paired t-test analyses indicated that additional training in genetics does not appear to geneticize physician attitudes. Training in genetics is not linked to differences in relativism, genetic determinism, and genetic discrimination. The author concludes that fears of geneticization through medical training may be overstated. Current modes of medical training in genetics should be analyzed to determine the elements that check geneticization so that training in environmental and behavioral factors can continue to be emphasized alongside genetics.

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INTRODUCTION

Medical genetics is increasingly important to medical practice. Genetics appears to influence the best treatment practices in all areas of medical practice.[1,2,3] Providers may soon use molecular medicine in addition to anatomical, surgical, and chemical treatments.[4] With this addition to the health care provider's "toolkit," best treatment regimens and standards of care of care likely to change.[5,6] Although there are specialists in medical genetics, there are too few to meet growing demands for genetic medicine.[1, 7] As the demand for medical genetics exceeds the current supply, there is a growing need for physicians to be versed in new genetic technologies.[8,9]

Despite a clear need, relatively few physicians employ genetic medicine. Although there has been extensive research on lay public attitudes toward genetics,[10,11,12,13,14] there has been less research on physician publics attitudes towards genetics, including genetic discrimination, genetic determinism and genetic relativism. Previous research has explored American physicians' technical knowledge of genetic medicine.[15,16,17] Less often explored is American physicians' social understanding of genetics. Unlike studies in the United Kingdom, Europe, Australia, and China,[4, 18,19,20,21,22,23,24,25] American physicians' social understanding of genetics is rarely addressed.

The purpose of this pilot study was to explore physician understandings of genetics as they are linked to medical education. If additional education lowers deterministic and discriminatory attitudes towards genetics, then concerns that medicine is becoming geneticized can be addressed. Alternatively, if additional education promotes greater deterministic and discriminatory attitudes, then a problem in medical education can be identified and addressed. This pilot study hopes to present some initial indicators on the role that additional education plays in physicians' social understanding of genetics.

PHYSICIANS AND GENETICS

Physicians recognize that they have a role in explaining medical genetics to patients and discussing the impact that genetics has on health outcomes.[7, 16,23, 26] Despite this awareness, many physicians are uncomfortable acting as genetic medical providers.[7, 17,18, 28] Although physicians are willing to make referrals, when the results come back, many are unwilling to provide basic genetic counseling.[6,9,20, 22] This unwillingness has been attributed often to knowledge gaps. Up to 75 percent of physicians lack basic knowledge of genetics, and will thus misunderstand the role of genetics in health.[6,7, 15,17, 22,23,24,25,26] Specialized training appears to influence practitioner understanding of medical genetics;

obstetricians/ gynecologists, neurologists, oncologists, and gastroenterologists each report great comfort with genetic technologies than do general practitioners.[15,16,20,29] Collectively and individually, these studies indicate that, as a physician is exposed to more information, her technical knowledge increases.

A physician's greater comfort with genetic medicine does not guarantee that patient treatment will improve. There has been considerable discussion over whether genetic medicine in educational curricula benefits or harms the patient. Education in medical genetics may change the assumptions and tools that a physician brings to the clinical encounter.[30,31] Although the tools may lead to more effective treatment, some researchers worry medical genetics education will encourage deterministic and discriminatory assumptions that will harm the patient and society.[32,33,34,35] Other researchers suggest that these concerns are overstated, holding that physicians will consider genetics alongside environmental and behavioral variables.[34,35,36,37] In addition to disputes over the impact of geneticization, it is unclear as to whether geneticization is a growing phenomenon or not.[38,39] Both sides in the discussion agree that medical education must not promote geneticization or its corollaries, genetic determinism and genetic discrimination.[40,41]

Geneticized medicine has the potential to make many of us already diseased. With more than 2000 known loci associated with Mendelian disorders and more than 4 million identified single nucleotide polymorphisms, Francis Collins's claim that “all of us carry dozens of glitches in our DNA” does not seem hyperbolic.[42] If physicians are trained to read the genetic code in a deterministic and discriminatory manner, all patients could be viewed through a geneticized lens.

Technical concerns about genetics in medicine are more likely to be addressed if a physician has graduated more recently from medical school, has taken coursework specific to genetics, or considers herself highly qualified in genetics. Social implications of genetics may articulated alongside technical information. As a physician obtains more information about genetic medicine, she may be trained to view genetics as a deterministic factor in health and adopt more discriminatory attitudes about genetics in social policy. As such, the central hypothesis in this study was:

H1: Physicians who have received more education about genetics will express more socially problematic attitudes in regard to genetics than will physicians who have received less education about genetics.

Two direct measures of education in genetics and three indirect measures were employed. Formal education, i.e. enrolling in a genetics course, may provide training that addresses both technical and the social concerns related to genetic medicine. Therefore, this study hypothesized:

H1a: Physicians who have taken a formal course in genetics in college will express more socially problematic attitudes in regard to genetics than will physicians who have not taken a college course in genetics.

H1b: Physicians who have taken a formal course in genetics in medical school will express more socially problematic attitudes in regard to genetics than will physicians who have not taken a medical school course in genetics.

In addition to specialized courses in genetics, genetics has been incorporated throughout medical curricula. Thus, those physicians who have graduated more recently are more likely to have technical competence in genetic medicine. Likewise, social issues related to genetics may be addressed in current curricula more often for more recent graduates. Therefore, this study hypothesized:

H1c: Younger physicians who will express more socially problematic attitudes in regard to genetics than will older physicians.

H1d: Physicians who have graduated more recently from medical school will express more socially problematic attitudes in regard to genetics than will physicians who have graduated less recently.

Finally, one's self-evaluation in medical genetics may influence their social comfort with genetic medicine and genetic technology. Thus, this study hypothesized:

H1a: Physicians who rate themselves as highly qualified in medical genetics will express more socially problematic attitudes in regard to genetics than will physicians who do not consider themselves highly qualified.

METHODS

PARTICIPANTS

Physicians were identified through lists obtained from the Ohio Medical Board representing all licensed physicians in Ohio. Six hundred physicians practicing in Ohio were identified and surveyed. Respondents were assured of the anonymity of their responses.

SURVEY

The survey consisted of two sections. The first section consisted of three reliable and validated scales designed to evaluate social attitudes about genetics. [43] These were the Genetic Determinism Instrument, the Genetic Relativism Scale, and the Genetic Discrimination Scale, The Genetic Determinism Instrument is a seven-item instrument that measures how strongly a participant agrees that health outcomes are controlled directly by a person's genetics. The Genetic Relativism Scale is an 11-item instrument that measures how strongly a participant agrees that a person's health outcomes are moderated by a variety of external factors. This Scale consists of three sub-measures: personal behaviors (i.e. that personal choice moderates genetic influences, 3 items), social support (i.e. that family and friendship networks moderate genetic influences, 3 items), and faith (i.e. that a Higher Power moderates genetic influence, 5 items). The Genetic Discrimination Scale is a 16-item instrument that measures how accepting a participant is of treating people differentially based on genetics. This Scale consists of five sub-measures: organizational discrimination (i.e. that a person's genetic make-up should be considered in employment decisions, 3 items), criminal discrimination (i.e. that persons convicted of crimes should have their genetic information recorded, 2 items), insurance discrimination (i.e. that a person's genetic make-up should be considered when assessing insurability, 4 items), physician discrimination (i.e. that physicians should be able to advise persons with genetic conditions against having children, 3 items), and individual/reproductive discrimination (i.e. that the participant would not want to have a spouse, partner, or child with a genetic condition, 4 items). The second section of the survey consisted of demographic items. Appropriate Institutional Review Boards approved the study.

ANALYSIS

Calculations were performed using SPSS version 11.5. Comparisons between groups were made using independent samples t-tests. As appropriate, nominal dichotomous variable were used for assignment. For continuous variables, participants were assigned to groups based on the midpoint for the question. Differences between groups were considered statistically significant at the .05 level.

RESULTS

PARTICIPANTS

Six hundred surveys were mailed. Fifteen surveys were undeliverable because of death or closure of practice. Of the 585 remaining surveys, 66 were returned. Although this return rate is only 11.3%, it is consistent with other surveys of physician attitudes toward genetics that did not offer continuing medical education credit or financial reimbursement.[6, 22, 44] Table 1 displays a full demographic breakdown.

Figure 1

Table 1: Demographics

Sex (N/%)		
Male	51	77.3
Female	15	22.7
Ethnicity (N/%)		
European American	61	93.8
Asian American	2	3.0
Hispanic White	1	1.5
"Human Race"	3	4.5
Medical Degree (N/%)		
Doctor of Osteopathic Medicine	45	68.2
Medical Doctor	21	31.8
Genetics Training (N/%)		
Took Course in College	53	80.3
Took Course in Medical School	45	68.2
Area of Practice (N/%)		
Generalists	29	43.9
Specialists	37	56.1
Annuated Variables (Mean/Range)		
Age	46.88	30-72
Years in Practice	14.89	1-48

NOTE: N=64; European American includes Hispanic White; "Human Race" is self-identified category

SURVEY

The survey materials were generally reliable. In the present sample, the Genetic Determinism Instrument had the lowest reliability, with a Cronbach's alpha of .52. Although this reliability is low, because the counterpart scale, the Genetic Relativism Scale was sufficiently reliabe the results were retained. The Genetic Relativism Scale, and all components, was reliable (faith factors, a=.89; social support factors, a=.85; personal behavior, a=.82). Likewise, the Genetic Discrimination Scale was reliable, with all components emerging as reliable (organizational discrimination, a=.75; criminal discrimination a=.76; insurance discrimination, a=.82; physician discrimination, a=.78; individual/reproductive discrimination, a=.93).

PHYSICIAN ATTITUDES ABOUT GENETICS

Because information about medical genetics has the potential to geneticize medicine, this study hypothesized that physicians who have received more education about genetics would express more socially problematic attitudes than would physicians who have received less education. The hypothesis was not confirmed. Additional education about genetics is not associated with more socially problematic attitudes. Additionally, the converse proposition – that additional education about genetics would lead to fewer socially problematic attitudes – gains no support from the present study.

Two direct measures of education in genetics were employed. Information with the potential to geneticize medicine may be presented in either the college or medical school genetics course. As indicated in Table 2, physicians who took a college course in genetics did not express more socially problematic attitudes than did physicians who did not. No differences in genetic determinism, genetic relativism, or genetic discrimination were found between the two populations, with the exception that physicians who did not take a college genetics course assign a higher role to personal behaviors in health outcomes than did physicians who took a course. Table 3 shows that there were no differences in socially problematic attitudes between physicians who took a medical school genetics course and those who did not, including the role of personal behaviors. These findings suggest that courses devoted to genetics are unlikely to promote geneticized attitudes.

Figure 2

Table 2: Comparison of means between attitudes of physicians who completed a genetics course in college to attitudes of physicians who did not

	Completed College Course	Did Not Complete	t	sig.
Genetic Determinism	4.18	4.19	-.101	n.s.
Genetic Discrimination				
Organizational	1.82	1.89	-.245	n.s.
Criminal	3.27	2.82	1.037	n.s.
Insurance	4.02	4.18	-.602	n.s.
Reproductive	2.00	2.52	-1.673	n.s.
Physician	2.46	2.40	.196	n.s.
Genetic Relativism				
Social Support	1.97	2.30	-1.061	n.s.
Personal Behaviors	2.15	2.92	-2.291	.025
Faith	1.97	2.05	-.238	n.s.

Note: N=66; d.f. 64.

In addition to direct measures of education, three indirect measures were employed. Genetics is increasingly included across the medical school curriculum. If medical education is geneticized throughout this curriculum, then physicians who graduated more recently may have received a more geneticized education than those who graduated less recently. This projected difference did not materialize. As indicated in Table 4, younger physicians did not express more socially problematic attitudes than did older physicians. Additioanlly, as shown in Table 5, physicians who have practiced for a shorter period of time did not express more socially problematic attitudes than did physicians who have been in practice longer. Finally, physicians who self-evaluated themselves a highly qualified in medical genetics did not express more socially problematic attitudes than physicians who did not consider themselves highly qualified. Table 6 indicates that the physicians who should be most geneticized – i.e. the experts – did not display higher levels of genetic discrimination or genetic determinism than did “non-expert” physicians. Moreover, the “experts” did not display lower levels of genetic relativism.

Figure 3

Table 3: Comparison of means between attitudes of physicians who completed a genetics course in medical school to attitudes of physicians who did not

	Completed Med School Course	Did Not Complete	t	sig.
Genetic Determinism	4.19	4.19	-.043	n.s.
Genetic Discrimination				
Organizational	1.67	1.97	-1.298	n.s.
Criminal	2.73	2.99	-.694	n.s.
Insurance	4.16	4.15	.052	n.s.
Reproductive	2.11	2.54	-1.578	n.s.
Physician	2.48	2.39	.346	n.s.
Genetic Relativism				
Social Support	2.35	2.19	.606	n.s.
Personal Behaviors	3.05	2.68	1.234	n.s.
Faith	1.84	2.11	-.967	n.s.

Note: N=66; d.f. 64.

Figure 4

Table 4: Comparison of means between older physician attitudes and younger physician attitudes

	Older	Younger	t	sig.
Genetic Determinism	4.18	4.19	-.112	n.s.
Genetic Discrimination				
Organizational	1.95	1.79	.742	n.s.
Criminal	2.66	3.17	-1.496	n.s.
Insurance	3.99	4.33	-1.602	n.s.
Reproductive	2.46	2.38	.347	n.s.
Physician	2.25	2.58	-1.393	n.s.
Genetic Relativism				
Social Support	2.26	2.21	.227	n.s.
Personal Behaviors	2.63	2.92	-1.011	n.s.
Faith	2.14	1.91	.910	n.s.

Note: N=66; Midpoint is 46.88 years; d.f. 64.

Figure 5

Table 5: Comparison of means between attitudes of physicians who have practiced longer to attitudes of physicians who have practiced for a shorter period

	Longer Practice	Shorter Practice	t	sig.
Genetic Determinism	4.17	4.20	-.258	n.s.
Genetic Discrimination				
Organizational	1.98	1.77	.992	n.s.
Criminal	2.71	3.11	-1.148	n.s.
Insurance	3.97	4.33	-1.705	n.s.
Reproductive	2.39	2.45	-.268	n.s.
Physician	2.24	2.59	-1.459	n.s.
Genetic Relativism				
Social Support	2.17	2.30	-.531	n.s.
Personal Behaviors	2.54	3.01	-1.746	n.s.
Faith	2.08	1.98	.384	n.s.

Note: N=66; Midpoint is 14.89 years of practice; d.f. 64.

Figure 6

Table 6: Comparison of means between attitudes of physicians who consider themselves highly qualified to attitudes of physicians who do not

	Lower Self-Evaluation	Higher Self-Evaluation	t	sig.
Genetic Determinism	4.17	4.23	-.536	n.s.
Genetic Discrimination				
Organizational	1.89	1.83	.230	n.s.
Criminal	3.04	2.56	1.264	n.s.
Insurance	4.19	4.06	.540	n.s.
Reproductive	2.43	2.40	.085	n.s.
Physician	2.47	2.28	.701	n.s.
Genetic Relativism				
Social Support	2.33	2.00	1.186	n.s.
Personal Behaviors	2.74	2.85	-.348	n.s.
Faith	2.16	1.69	1.691	n.s.

Note: N=66; d.f. 64; calculation: (("I have a strong understanding of genetics" + "My training in genetics for medical practice is very good") – ("Most physicians have a strong understanding of genetics" + "Most physicians' training in genetics for medical practice is very good")); cut point = -.10

DISCUSSION AND IMPLICATIONS

This study indicates that concerns of geneticization through medical education may be overstated. Although there are many references to "genes for" various diseases and disorders, physicians who have more training in recognizing these genes are neither more nor less likely to view a "gene for" a disease in a deterministic or discriminatory manner. It

also seems unlikely that physicians who view themselves as better trained in genetics or who have more coursework in genetics would adopt much more aggressive and risky treatments more often than would physicians who view themselves a less well trained or who lack formal coursework. Despite debate over how deterministic and discriminatory the portrayal of genetic factors is, it appears that these messages are unlikely to lead to practicing physicians who adopt deterministic and discriminatory attitudes.

Although the current findings indicate that geneticization is not a necessary result of genetic medical education, there are several limitations to the study that should be addressed. First, the study relies on a small sample with a relatively low response rate. Because of financial constraints, this study was unable to offer a sufficient incentive for high rates of participation. Offering substantial incentives may encourage greater participation. In addition, it should be noted that this study was a pilot study. Larger populations of physicians should be consulted, and those populations should be more diverse than the one outlined here. The physicians who responded were largely European American and male. The results may not be representative of other physicians. Despite these limitations, the study does offer an important direction for future consideration.

In this study, additional training in genetics did not appear to lead to deterministic and discriminatory attitudes. It may be that, even as genetic medicine is incorporated into the medical school curriculum, medical education is not excluding environmental and behavioral variables. With additional advances in genetic medicine, the temptation to exclude variables other than genetic ones may grow. Because it appears that the current treatment of genetic variables in medical education is appropriately balanced, current modes of medical training in genetics should be analyzed to determine how environmental and behavioral factors are emphasized alongside genetics. By examining the current balance, it may be possible to continue this balanced treatment in the future. In performing this examination, we can work to ensure that geneticized medicine is prevented and that genetic medicine does not become the only kind of medicine that we can practice.

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