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## Use of genetic tests among neurologists and psychiatrists: Knowledge, attitudes, behaviors, and needs for training

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### Abstract

This study explores neurologists' and psychiatrists' knowledge, attitudes, and practices concerning genetic tests. Psychiatrists ( $n=5,316$ ) and neurologists ( $n=2,167$ ) on the American Medical Association master list who had agreed to receive surveys were sent an email link to a survey about their attitudes and practices regarding genetic testing; 372 psychiatrists and 163 neurologists responded. A higher proportion of neurologists (74%) than psychiatrists (14%) who responded to the survey had ordered genetic testing in the past 6 months. Overall, most respondents thought that genetic tests should be performed more frequently, but almost half believed genetic tests could harm patients psychologically and considered legal protections inadequate. Almost half of neurologists (49%) and over 75% of psychiatrists did not have a genetics professional to whom to refer patients; those who had ordered genetic tests were more likely than those who did not do so to have access to a genetic counselor. Of respondents, 10% had received patient requests not to document genetic information and 15% had received inquiries about direct-to-consumer genetic testing. Neurologists reported themselves to be relatively more experienced and knowledgeable about genetics than psychiatrists. These data, the first to examine several important issues concerning knowledge, attitudes and behaviors of neurologists and psychiatrists regarding genetic tests, have important implications for future practice, research, and education.

### Keywords

decision making; insurance; discrimination; ethics; medical education; genetic testing; genetic counseling

### INTRODUCTION

Increasingly, researchers are discovering genetic markers associated with a wide variety of disorders that involve the brain, and are treated by neurologists and psychiatrists. In these two fields the number of clinical genetic tests available is thus rapidly rising (Farmer 2007; Finn, 2007; Hoop 2008; Laegsgaard 2008; Mitchel 2010), and hence the need for increased genetics knowledge among these specialists. In both fields, physicians diagnose and treat

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patients with neurodevelopmental and neurodegenerative disorders, and other highly complex diseases involving the brain. Markers associated with Huntington's disease (HD), Alzheimer's, autism, depression, bipolar disorder, and schizophrenia have been identified (Hoop 2008), and companies have marketed pharmacogenomic tests for psychiatric medications (<https://www.genomind.com>). In upcoming years, the use of genetic tests in both fields is expected to increase (Hoop 2008; Mrazek 2010; Seretti 2007). Yet the extent to which front-line clinicians in either specialty are capable of obtaining and using genetic information with their patients effectively and ethically is unclear. Given the overlap between these fields, one might anticipate relatively similar levels of comfort, experiences and concerns with genetic testing, but few data are available concerning clinicians' knowledge, attitudes, and behaviors regarding the use of genetic tests both within and between each of these fields; thus critical questions remain.

Only one previous study has examined clinicians' perspectives on genetic testing for neurological disease. That study examined the views of German neurologists, psychiatrists, and psychotherapists toward HD testing (Thies 1993). Conducted in 1992, before a direct test was available, it showed that 17% would recommend testing for all at-risk persons, and 80% thought that at-risk individuals should refrain from having biological children. This study did not compare the responses of these different groups of providers or examine factors that may have influenced their views.

A few studies have examined psychiatrists' familiarity with, and attitudes towards genetic testing (Lawrence 2011). Most psychiatrists considered their specialty the most appropriate for counseling psychiatric patients about the role of genetics in their conditions (Hoop 2008); saw discussion of genetic information with patients and families as part of their role (Finn 2005; Hoop 2008); and viewed genetic information as clinically relevant. Yet, in 2002, only 23% of 352 respondents felt competent to discuss genetic information with patients, only 15% felt prepared (adequately trained) to do so, and only 1% correctly answered all ten questions posed about genetics (Finn 2005). In 2008, 80% of 45 U.S. psychiatrists felt that genetic testing would help many psychiatric patients (Hoop 2008). Psychiatrists reported that they would welcome more training in genetics and incorporation of genetics into clinical care (Lawrence 2011). In a survey of psychiatric researchers and clinicians, 72% stated that they would test all first episode patients with schizophrenia, and 73% all chronic patients (DeLisi 2006). Many psychiatrists said that if genetic tests were available for schizophrenia, they would use them to test asymptomatic adults with a family history of schizophrenia (45%) or borderline personality disorder (43%) (Finn 2005). Furthermore, psychiatrists thought genetics has a moderately strong influence on several psychiatric diagnoses.

### **Purpose of the Study**

Despite these studies, many important issues concerning views and behaviors of neurologists and psychiatrists regarding genetic testing remain unanswered, including barriers and facilitators to appropriate use of genetic tests. Moreover, since these prior studies were conducted, knowledge about genetics and the availability of genetic tests have continued to increase, making on-going assessment of provider attitudes and practices vital. As identification of genetic markers associated with neurological and psychiatric conditions continues to expand rapidly, and companies are marketing tests to providers in both fields, needs clearly arise to prepare these practitioners as best as possible to understand and make decisions about genetic tests that exist now and will be increasingly available in the future. Hence, it is vital to gauge these specialists' current levels of knowledge, attitudes and practices regarding genetic tests. A critic might aver that such assessments should wait until more tests are more widely used in these fields. But given that major gaps persist in understanding these providers' current views and experiences, exploration of these practices

and knowledge deficits is critical in order to design and implement educational and other interventions as early and effectively as possible. Thus, we decided to investigate key aspects of neurologists' and psychiatrists' practices, attitudes, and knowledge concerning genetic testing.

## METHODS

### Sample

An invitation to a web-based survey was e-mailed to all neurologists and psychiatrists on the American Medical Association (AMA) master list who had provided e-mail addresses and opted-in to receive surveys. We sent an invitation and three reminders by email to potential respondents over a period of 3 weeks. Among 2,167 neurologists and 5,316 psychiatrists with valid email addresses, 535 responded, including 163 (7.5%) neurologists and 372 (7.0%) psychiatrists.

The NY State Psychiatric Institute IRB approved the study. Before answering survey questions, all of the participants gave informed consent after reviewing an online study information sheet explaining the project.

### Instrumentation

The survey instrument was developed based on our prior study of internists (Klitzman 2012), past published literature, and clinical experience, and was accessible through the online survey system Survey Monkey ([www.surveymonkey.com](http://www.surveymonkey.com)). The following domains were examined: 1) demographics of respondents and their patients; 2) clinicians' self-reported knowledge of genetics and genetic testing; 3) clinicians' practices concerning genetic testing and genetic privacy; 4) barriers and facilitators to appropriate use of genetic tests; 5) attitudes toward genetic tests; and 6) self-identified needs for education. The surveys for the neurologists and psychiatrists consisted of 52 and 62 questions, respectively, and took approximately 15 to 20 minutes to complete. The psychiatrist survey included additional tests about the genetic basis for several psychiatric disorders. Both surveys were composed primarily of dichotomous, multiple choice, and Likert scale questions, and some clarifying free response questions. We have provided representative questions in the Appendix. Survey questions are also reflected in the items in Tables I and II. In some instances we have collapsed categories of responses (e.g., combining "somewhat agree" and "strongly agree"; and combining "somewhat disagree" and "strongly disagree") to clarify the results and facilitate their interpretation conceptually. Before distribution, the survey was piloted with six clinicians, three each in psychiatry and neurology, and revised accordingly.

### Data Analysis

Statistical analyses included chi-square tests for examination of categorical variables, simple binary logistic regressions, and a multiple logistic regression to explore independent factors associated with ordering genetic tests. Analyses were carried out within and across each specialty. We individually entered into a simple binary logistic regression model all of the variables we found in univariate analyses to be significantly associated with psychiatrists and neurologists having ordered a genetic test. All variables found to be significant in the simple binary logistic regression model were then entered into a multiple binary logistic regression model. We then reran the regression, including only those variables that were significant or a trend.

## RESULTS

### Sociodemographics

As shown in Table I, 31% of respondents were neurologists and 69% psychiatrists; 63% were male; 62% were over 49; and 71% were Caucasian; there were no significant differences on these variables between neurologists and psychiatrists. Respondents reported that their patients were moderately ethnically and economically diverse: only 34.7% had practices that were more than 75% white, and 15.1% reported that more than three quarters of their patients were privately insured (10.0% of neurologists vs. 17.4% of psychiatrists,  $p < .001$ ).

### Use of Genetic Tests

Although neurologists and psychiatrists were similar in sociodemographic characteristics, they differed markedly in their use of genetic tests (Table II). A substantially greater proportion of neurologists (74%) than psychiatrists (14%) had ordered a genetic test for a patient in the past 6 months. Similarly, more neurologists than psychiatrists had: been asked by patients about genetic testing, had a geneticist or genetic counselor to whom to refer patients, and/or had received commercial advertising from genetic testing laboratories. A small but noteworthy percent of respondents had confronted concerns about genetic privacy and discrimination. Overall, 10% had patients who requested that genetic test results remain undocumented, and this proportion was greater in neurologists (15%) than psychiatrists (7%). Only 2.8% of respondents reported that they had tested patients under a pseudonym, and this proportion did not differ significantly between the two groups. Fifteen percent of respondents had patients inquire about direct-to-consumer genetic tests, with no difference between neurologists and psychiatrists.

Among the tests ordered by neurologists, 33.4% were for neuromuscular disorders, 32.1% for movement disorders, 5.7% were for pediatric neurological conditions, 6.2% were for stroke, and only 2.1% were for pharmacogenomics (Table III). Of 43 psychiatrists who had administered genetic tests in the last 6 months, 31 provided the types of tests they had ordered, and a total of 49 tests were reported (i.e., several respondents had ordered more than one type of test). Of these tests (see Table IV), 46.9% were for pharmacogenomics [e.g. Cytochrome P450 and the Genomind Genecept Assay (<https://www.genomind.com>)]. Tests were also ordered, though less commonly, to assist with diagnoses of dementia, learning disabilities, and other psychiatric, neurological and medical conditions.

### Knowledge of Genetics and Genetic Testing

Most respondents reported deficits in their knowledge of genetics. As seen in Table V, respondents who had ordered genetic tests rated their knowledge of genetics higher than those who had not ordered tests. Only 33% of respondents felt confident about how to order and where to send genetic tests, and as expected, those who had ordered tests were significantly more likely to say they were confident (63.8% vs. 18.3%;  $p < 0.001$ ). Similarly, most respondents reported they could use more training in how to interpret test results, and this proportion was higher in those who had never ordered tests (88.7%) than in those who had (74%). Over half of respondents reported that better knowledge of statistics by physicians would promote more effective genetic testing.

### Attitudes towards Genetic Tests: Barriers and Facilitators

Most respondents thought that genetic tests should be performed more often in their specialty (68% of those who had ordered tests, and 55% of those who had not,  $p = 0.019$ ), yet almost half thought that genetic tests could cause psychological harm for their patients, with

no difference between those who had or had not ordered tests. A substantial proportion of respondents considered legal protections against genetic discrimination inadequate (35% of those who had ordered tests and 53% of those who had not,  $p<0.006$ ). Respondents who had ordered genetic tests were significantly less likely to disagree with the statement that “electronic medical records are private” than were those who had not (29% vs. 44%,  $p=0.005$ ).

Of the twelve variables found to be significant in univariate analyses (i.e. specialty, whether or not patients had asked about genetic testing, confidence about how to order and where to send genetic tests, whether or not practitioner had received advertising from genetic testing laboratories, adequacy of legal protections for genetic testing, >75% of patients with private insurance, age, >25% of patients without insurance, knowledge of genetics, desire for more training in how to interpret genetic tests, frequency with which genetic tests should be performed, whether or not patients asked for genetic test information not be documented), the first six of these were significant in a simple binary logistic regression analysis. Of these six, the first four were significant or trends in the multiple binary logistic model. A second regression was run with these four covariates, of which, as seen in Table VI, the first three (being a neurologist, patients asking about testing, and confidence in how to order and where to send tests) were significantly associated with ordering a genetic test. The results were also suggestive for receiving advertisements from genetic testing laboratories.

## DISCUSSION

These data, the first to examine several critical issues concerning knowledge, attitudes, and behaviors of neurologists and psychiatrists regarding genetic tests, have important implications for future practice, research and education. Despite several common patient populations, neurologists appear to have much greater experience with genetic tests than psychiatrists (i.e., 163 neurologists ordered a total of 389 genetic tests; while 372 psychiatrists ordered a total of 49 genetic tests). The most commonly ordered categories of tests were related to stroke, neuromuscular disorders, and movement disorders for neurologists; and pharmacogenomics for psychiatrists. Thus, the clinical utility and indications for ordering tests (e.g., for diagnosis and/or treatment) may vary between these two specialties. Importantly, however, both groups continue to report large gaps in self-perceived knowledge and confidence, and other ongoing barriers to use of these tests. Psychiatrists in our study appear to have used genetic tests to try to diagnose learning disabilities and dementia, and to have used pharmacogenomic tests to help treatment. Several batteries of tests are being marketed that purport to provide pharmacogenomic information about psychiatric medications. The use of these pharmacogenomic assays has been discussed (Mrazek 2010), but the clinical utility of these tests has not yet been fully demonstrated [e.g., using randomized clinical trials (Mrazek 2010)], raising concerns. Psychiatrists may also consult with patients confronting decisions of whether to undergo testing for other, medical conditions [e.g., breast cancer (BRCA)].

The findings suggest that professionals in both specialties continue to perceive deficits in their knowledge of when to order, and how to interpret genetic tests. Given the growing importance of genetics in medicine, the persistence of these perceived knowledge deficits, even ten years after they were first described, is concerning. Changes in medical school curricula will have a cumulative impact over time, but greater attention to genetics in CME programs is also warranted. On-line educational modules can potentially help both providers and patients, and could be available for immediate decision support through links to providers who use electronic medical records and electronic order entry. Professional organizations should consider sponsoring online CME courses tailored to subspecialties and unbiased by commercial interests of testing laboratories or others. This strategy has been

used by the Genetics in Primary Care Institute, which is producing a series of 30-minute webinars called “Time Out for Genetics for Primary Care Pediatricians” (Genetics in Primary Care Institute 2013).

It is striking that almost half of neurologists (49%) and over 75% of psychiatrists do not have a genetic counselor or geneticist to whom to refer patients. Given that many practicing neurologists and psychiatrists may lack the time and knowledge to address complex, nuanced issues regarding genetic testing, these data underscore the need for increased numbers of genetic professionals, who are currently in short supply in the US. In the interim, provision of genetic services by video conferencing is one possible mechanism to increase access to genetic services for highly specialized areas or for patients who are geographically isolated from genetic services, if issues related to provision of and billing for medical services across state lines can be addressed.

Barriers to genetic testing appear to include providers’ concerns about potential psychological harm to patients, along with the privacy of genetic data and potential discrimination. Of note, 10% of respondents have had patients request that genetic test information not be documented, and 2.8% have had patients test under a pseudonym. The persistence of concerns about discrimination, even after the implementation of the federal Genetic Information Non-discrimination Act (GINA), highlights ongoing needs for attention. In part, these concerns may reflect ignorance of current laws, both of GINA and of state laws that may provide protection (Klitzman 2012). But the relatively limited reach of many of these statutes (i.e., their application to health insurance, but not to disability or life insurance) suggests that additional protections may also be helpful.

Tensions exist since respondents felt genetic tests should be performed more often, but that these tests could cause psychological harm, and that current protection for genetic discrimination may be inadequate. Perhaps as a result, psychiatrists have thought that they should best counsel patients about the role of the genetics in patients’ conditions – i.e., that the complexities and potential negative repercussions of these tests need to be addressed carefully with patients. In part, these disorders often have unclear etiologies, and may generate fear and stigma (e.g., autism, mental retardation, and Alzheimer’s). Tests may thus cause short-term psychological upset, but also provide longer-term benefits for diagnoses and treatment that could outweigh these potential harms. While initial studies have explored psychological distress and/or discrimination in genetic testing, particularly for HD and BRCA (Klitzman, 2010; Meiser, 2000), the present data highlight needs to understand these phenomena more fully – e.g., the effects of patient, family, and provider understandings of genetic risks on psychological variables and discrimination.

The association of ordering tests with the individual variables of patients’ inquiries about testing, belief that laws protect against genetic discrimination, and having more patients with private insurance, raise a number of concerns as well. These include the possibility that insurance status affects access to genetic testing, and that utilization of tests is driven in part by patients’ requests. Though the amount of genetic discrimination that occurs remains unclear (Klitzman 2010), it is possible that at least some physicians who order tests are only minimally concerned about potential discrimination. Future research is clearly needed to examine these issues more fully.

### Study Limitations

This study has several limitations, including a low rate of response from those invited to participate, which may raise questions about the generalizability of our data. Yet our sample still comprises the largest to date of both neurologists and psychiatrists, and this study is the first to examine a number of issues of critical concern, such as the proportion of physicians

who have had patients who test under pseudonyms and who request that these doctors not document genetic test results. Moreover, although response rates in studies have been declining steeply (Melnyk 2012), especially among physicians (Cull 2005; Galea 2007), research has suggested that low response rates do not necessarily result in non-response bias (Cull 2005). Such bias, in any cases may be of less concern in surveys of doctors than in those of the general public (Asch 2000; Guadagnoli 1989; Hovland 1980; Kellerman 2001). Kellerman, for instance, notes that "...physicians as a group are more homogeneous regarding knowledge, training, attitudes, and behavior than the general population" (Kellerman 2001, p. 65).

Our sample did not differ significantly from national samples of neurologists or psychiatrists (based on data obtained from the American Neurological Association and the American Psychiatric Association) in ethnicity (White vs. non-White), age, or type of practice (solo vs. other). Our sample of neurologists did differ from the national sample in having more women (33% vs. 23%,  $p < .012$ ), and there was a slight trend toward a younger age ( $p < .093$ ). This trend for younger participants in our sample may reflect greater comfort with the internet, which we used for recruitment and administration of the survey. Future research can explore these relationships more fully.

The survey also relied on self-reports, with the usual uncertain validity of responses. Methodological adjustments may increase the response rate in future studies. As an incentive, we also offered only a \$5 gift card at a coffee chain. Future studies can offer additional compensation, which may increase response rates as well. We obtained the list of e-mail addresses from the AMA, but did not have potential respondents' phone numbers, or office or home addresses. Future studies may increase the response rate by sending an announcement of the study itself or reminders by regular mail, rather than e-mail alone.

## Conclusion

In sum, these data highlight gaps in physicians' perceived understanding of genetic tests in neurology and psychiatry and possible barriers to wider use of such tests, even as these tests become more available in these specialties. These data frame and underscore critical questions that can be explored in future research, including why patients decline genetic testing (i.e., for which tests and for what reasons), what kinds of discrimination patients may experience, how physicians' respond to patients' requests to have genetic information excluded from the medical record, what physicians say when patients ask about direct-to-consumer testing, and what patients then decide to do.

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**Table I**

## Sociodemographics\*

Sociodemographics of Respondents	Total % (n)	Neurologists % (n)	Psychiatrists % (n)	p value
<b>Gender</b>				
Male	63.2% (240)	66.1% (78)	61.8% (162)	n.s.
<b>Age</b>				
< 49 years	37.4% (142)	44.1% (52)	34.4% (90)	0.07
<b>Race</b>				
Not White	21.0% (71)	18.4% (19)	22.1% (52)	n.s.
<b>Approx. what % of patient population is:</b>				
>75% White	34.7% (124)	33.0% (36)	35.5% (88)	n.s.
>75% with private insurance	15.1% (53)	10.0% (11)	17.4% (42)	<0.001
>25% without insurance coverage	29.9% (97)	8.5% (8)	38.7% (89)	<0.001

\*ns for different analyses vary because of missing data

**Table II**

## Practices and Behaviors

Characteristics of Respondents	Total % (n)	Neurologists % (n)*	Psychiatrists % (n)	p value
<b><u>In past 6 months, ordered genetic tests?</u></b>				<.0001
Yes	33.0% (149)	74.1% (106)	14.0% (43)	
No	67.0% (302)	25.9% (37)	86.0% (265)	
<b><u>In past 6 months, # of times patients asked about GT?</u></b>				<.0001
More than 5	18.7% (85)	37.9% (55)	9.7% (30)	
1–4 times	35.2% (160)	42.1% (61)	31.9% (99)	
None	46.2% (210)	20.0% (29)	58.4% (181)	
<b><u>Have a geneticist/genetic counselor to whom refer patients?</u></b>				<.0001
Yes	32.5% (147)	51.0% (73)	23.9% (74)	
No	67.5% (305)	49.0% (70)	76.1% (235)	
<b><u>Received commercial advertising from GT labs?</u></b>				n.s.
Yes	43.4% (165)	76.3% (90)	28.6% (75)	
No	56.6% (215)	23.7% (28)	71.4% (187)	
<b><u>Any patients requested you not document GT information?</u></b>				0.019
Yes	10.0% (39)	15.3% (19)	7.5% (20)	
No	90.0% (351)	84.7% (105)	92.5% (246)	
<b><u>Any patients had GT under pseudonym?</u></b>				n.s.
Yes	2.8% (11)	3.2% (4)	2.6% (7)	
No	97.2% (380)	96.8% (120)	97.4% (260)	
<b><u>Patients ever inquired about direct to consumer GT?</u></b>				n.s.
Yes	14.6% (66)	16.9% (24)	13.6% (42)	
No	85.4% (385)	83.1% (118)	86.4% (267)	

\*ns for different analyses vary because of missing data.

**Table III**

Genetic tests ordered by neurologists in the past 6 months

Tests Ordered	%* (n)
<b>Neuromuscular Disorders</b>	
Muscular dystrophy	11.3% (44)
Neuropathy	10.2% (40)
Spinal muscular atrophy	3.9% (15)
Amyotrophic lateral sclerosis	3.3% (13)
Other neuromuscular	4.6% (18)
<b>Movement Disorders</b>	
Ataxia	12.3% (48)
Huntington's disease	11.6% (45)
Dystonia	3.6% (14)
Parkinson's disease	2.1% (8)
Other movement disorders	2.6% (10)
<b>Dementia</b>	
Alzheimer's disease	5.1% (20)
Other dementias	1.5% (6)
<b>Stroke</b>	
Stroke risk	5.4% (21)
CADASIL	0.8% (3)
<b>Pediatric Neurology</b>	
Pediatric syndromes	3.1% (12)
Other pediatric disorders	2.6% (10)
<b>Pharmacogenomics</b>	2.1% (8)
<b>Epilepsy</b>	1.8% (7)
<b>Other Disorders</b>	12.1% (47)

\* percentages represent the proportion of all tests ordered (389) by the 143 neurologists

**Table IV**

Genetic tests ordered by psychiatrists\* in the past 6 months

Tests Ordered	% (n)
<b>Pharmacogenomics</b>	46.9% (23)
<b>Diagnostic/ Predictive for Psychiatric Disorders</b>	
Alzheimer's	10.2% (5)
Fragile X Syndrome	6.1% (3)
Downs Syndrome	4.1% (2)
Huntington's Disease	4.1% (2)
Methylation (Angelman Syndrome, Prader-Willi Syndrome)	4.1% (2)
XXY (Klinefelter's Syndrome)	4.1% (2)
Other	10.2% (5)
<b>Other Medical Conditions</b>	
Breast Cancer	4.1% (2)
Other	6.1% (3)

\* Of 43 psychiatrists who responded that they had administered genetic tests in the last 6 months, 31 reported the types of tests they had ordered. A total of 49 tests were performed.

**Table V**

Beliefs and attitudes among both psychiatrists and neurologists\*

Characteristics of Respondents	Total % (n)	Ordered genetic test % (n)	Never ordered genetic test % (n)	OR	95% CI	p value
<b><u>How would you rate your knowledge of genetics</u></b>						
1 (Very Poor)	4.6% (18)	2.3% (3)	5.7% (15)	0.185	0.043–0.801	0.024
2	17.8% (69)	8.7% (11)	22.2% (58)	0.175	0.063–0.484	0.001
3	49.6% (192)	47.6% (60)	50.6% (132)	0.419	0.181–0.974	0.043
4	21.4% (83)	31.0% (39)	16.9% (44)	0.818	0.334–2.004	NS
5 (Very Good)	6.5% (25)	10.3% (13)	4.6% (12)	1.0	(referent)	
<b><u>I am confident about how to order /where to send GTs</u></b>						
somewhat/strongly agree	33.4% (131)	63.8% (83)	18.3% (48)	4.608	2.494–8.547	<.001
neither agree nor disagree	19.6% (77)	16.2% (21)	21.3% (56)	1.0	(referent)	
strongly/somewhat disagree	47.2% (185)	20.0% (26)	60.5% (159)	0.436	0.227–0.836	0.012
<b><u>I could use more training in how to interpret test results</u></b>						
Yes	83.8% (321)	74.0% (94)	88.7% (227)	0.364	0.209–0.633	<.001
No	16.2% (62)	26.0% (33)	11.3% (29)	1.0	(referent)	
<b><u>To what degree would a better understanding of statistics facilitate your use of GTs?</u></b>						
Moderate, High	55.1% (210)	53.2% (67)	56.1% (143)	0.889	0.579–1.365	NS
Very Low, Low, None	44.9% (171)	46.8% (59)	43.9% (112)	1.0	(referent)	
<b><u>Compared with current neurology/psychiatry practices, should GTs be performed?</u></b>						
more often	69.8% (275)	68.5% (87)	55.0% (144)	0.578	0.365–0.914	0.019
about the same	36.3% (143)	29.1% (37)	40.5% (106)	1.0	(referent)	
less often	3.8% (15)	2.4% (3)	4.6% (12)	1.396	0.373–5.223	NS
<b><u>To what extent do you agree with the following:</u></b>						
<b><u>My patients have a low understanding of genetics</u></b>						
somewhat/strongly agree	69.8% (275)	66.4% (87)	71.5% (188)	0.653	0.039–1.086	NS
neither agree nor disagree	20.8% (82)	26.0% (34)	18.3% (48)	1.0	(referent)	
strongly/somewhat disagree	9.4% (37)	7.6% (10)	10.3% (27)	0.523	0.224–1.22	NS
<b><u>Legal protections against genetic discrimination are adequate</u></b>						
somewhat/strongly agree	16.2% (64)	21.5% (28)	13.6% (36)	1.222	0.673–2.222	NS
neither agree nor disagree	36.5% (144)	43.1% (56)	33.3% (88)	1.0	(referent)	

Characteristics of Respondents	Total		Ordered genetic test		Never ordered genetic test		OR	95% CI	p value
	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)			
<b>Characteristics of Respondents</b>									
strongly/somewhat disagree	47.2% (186)	35.4% (46)			53.0% (140)		0.516	0.322–0.828	0.006
<b>GTs can harm patients psychologically</b>									
somewhat/strongly agree	46.1% (182)	48.1% (63)			45.1% (119)		1.401	0.838–2.342	NS
neither agree nor disagree	28.6% (113)	23.7% (31)			31.1% (82)		1.0	(referent)	
strongly/somewhat disagree	25.3% (100)	28.2% (37)			23.9% (63)		1.553	0.870–2.770	NS
<b>Electronic Medical Records are Private</b>									
somewhat/strongly agree	43.1% (170)	47.7% (62)			40.9% (108)		0.759	0.433–1.175	NS
neither agree nor disagree	18.3% (72)	23.8% (31)			15.5% (41)		1.0	(referent)	
strongly/somewhat disagree	38.6% (152)	28.5% (37)			43.6% (115)		0.426	0.235–0.772	0.005

\* ns for different analyses vary because of missing data

**Table VI**

Multiple Regression Analysis – Factors associated with ordering a genetic test

Associations	OR	95% CI	p value
Physician Specialty (neurology)	7.3	3.83–13.89	<0.001
Patients have asked about genetic tests in past 6 months	4.6	2.42–8.85	<0.001
Confident how to order/where to send tests	4.5	2.42–8.25	<0.001
Received advertisements from genetic testing labs	1.8	0.97–3.37	0.063