Clinical Applications in Pharmacogenomics/Genomic Medicine

Post-Course Survey

Note: Students will be asked questions specific to the course in which they are enrolled. This is denoted throughout by use of "[pharmacogenomics/genomic medicine]" to indicate that the survey question will reflect the appropriate course.

Randomization Code: _____

Section I: Demographics and Basic Information

Have you ever undergone consumer-based personal genotyping (performed by a company that does NOT go through your health care provider)?

a. Yes
b. No

If yes, display the following:

Which company performed your personal genotyping?

a. 23andMe
b. deCODEme
c. Corriell Institute
d. DNA Direct
e. Navigenics
f. Pathway Genomics
g. Other (specify): _____

Have you ever undergone genetic or pharmacogenomic testing as part of your clinical care?

a. Yes
b. No
c. I don't know

What course are you currently taking and completing this survey for?

a. Clinical Applications of Pharmacogenomics (offered during the FIRST 8 weeks of the Fall semester/Fall A)
b. Clinical Applications of Genomic Medicine (offered during the SECOND 8 weeks of the Fall semester/Fall B)

If 'Clinical Applications of Pharmacogenomics,' display the following:

Did you undergo the optional personal genotyping in this course?

a. Yes
b. No
c. I don't know

If 'Clinical Applications of Genomic Medicine,' display the following:

Did you take the 'Clinical Applications of Pharmacogenomics' course?

a. Yes
b. No

If yes, display the following:

Did you undergo the optional personal genotyping in the course?

a. Yes
b. No

How many lectures did you view for this course?

a. 0
b. 1
c. 2
d. 3
e. 4
f. 5
g. 6
h. 7
i. 8

How many live, web-based meetings did you attend for this course?

a. 0
b. 1
c. 2
d. 3
e. 4
f. 5
g. 6
h. 7
i. 8

For students who took Clinical Applications of Pharmacogenomics (Fall A) and Clinical Applications of Genomic Medicine (Fall B), which course do you feel was most beneficial in influencing your future practice?

a. Clinical Applications of Pharmacogenomics
b. Clinical Applications of Genomic Medicine
c. They were equally beneficial
d. N/A (I did not take both courses)

If a, b, or c is selected, display the following question:

Why?

[Freeform comment field]

Section II: Attitudes about personal genotyping and genetic/pharmacogenomics testing

I understand the difference between consumer-based personal genome testing (personal genotyping) and [pharmacogenomics/genetic] testing that is part of clinical care.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I understand the risks and benefits of [pharmacogenomic/genetic] testing.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I know enough about [pharmacogenomic/genetic] testing to understand test results.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

[Pharmacogenomics/Genomic medicine] will play an important role in my future career.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

Most health care professionals have enough knowledge to interpret [pharmacogenomic/genetic] test results.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

Most people can accurately interpret their personal genotype test results.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I feel comfortable answering questions from patients about [pharmacogenomics/genomic medicine].

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

At this time, would you pursue consumer-based personal genotyping through a commercial company (e.g., 23andMe)?

a. Yes
b. No
c. I already have

If yes or I already have, display the following 4 questions:

Which of the following best describes your reason(s) for pursuing consumer-based personal genotyping? (Select all that apply)

a. To satisfy general curiosity about my genetic make-up
b. To see if a specific disease runs in my family or in my DNA
c. To see if a specific drug response or adverse drug reaction runs in my family or in my DNA
d. To learn about my genetic make-up without going through a health care provider

e. To inform family members of health risks
f. I have a right to know my genetic make-up if a service is available
g. Other (specify): _____

Would you share results of consumer-based personal genotyping with your health care provider(s)?

a. Yes, regardless of my results
b. Yes, but only if I am at high risk for something
c. Yes, but only if I am not at high risk for something
d. No
e. I'm not sure

Would you consult your health care provider(s) for help interpreting the results of consumer-based personal genotyping?

a. Yes
b. No

If you would consult with a health care provider for help interpreting these results, which type of health care provider would you ask? (Select all that apply)

a. My primary care physician (e.g. Family Medicine, Internist)
b. A subspecialty physician (e.g. Cardiologist, Neurologist)
c. A geneticist
d. A genetic counselor
e. A pharmacist
f. It would depend on the result
g. Not sure

If no, display the following:

Which of the following best describes your reasons for not pursuing consumer-based personal genotype evaluation at this time? (Select all that apply)

a. Limited evidence for a test's ability to measure the genotype of interest accurately and reliably
b. Limited evidence of a test's usefulness in the clinic and the resulting changes in health outcomes
c. Limited accuracy of genotype data
d. Poor quality of data analysis/interpretation
e. The array of SNPs and/or conditions tested with consumer-based personal genotyping is too limited
f. Price is too high
g. I would not understand my test results
h. I would not be able to interpret my results
i. Other (specify): _____

At this time, would you (as a health care provider) recommend consumer-based personal genotyping through a commercial company (e.g., 23andMe) for patients?

a. Yes
b. No

If yes, display the following:

Which of the following best describes your reason(s) for recommending personal genotyping for a patient? (Select all that apply)

a. To satisfy general curiosity about their genetic make-up
b. To see if a specific disease runs in their family or in their DNA
c. To see if a specific drug response or adverse drug reaction runs in their family or in their DNA
d. To learn about their genetic make-up without going through a health care provider
e. To inform family members of health risks

f. Individuals have a right to know their genetic make-up if a service is available
g. Other (specify): _____

If no, display the following:

Which of the following best describes your reasons for recommending against personal genotyping for a patient? (Select all that apply)

a. Limited evidence for a test's ability to measure the genotype of interest accurately and reliably
b. Limited evidence of a test's usefulness in the clinic and the resulting changes in health outcomes
c. Limited accuracy of genotype data
d. Poor quality of data analysis/interpretation
e. The array of SNPs and/or conditions tested with consumer-based personal genotyping is too limited
f. Price is too high
g. Individuals have limited ability to understand their test results
h. Individuals have limited ability to interpret their test results
i. There are not enough trained health care providers to help patients interpret their results
j. Other (specify): _____

Would you undergo [pharmacogenomic/genetic] testing as part of your clinical care in the future?

a. Yes
b. No

If yes, display the following:

Which of the following best describes your reasons for undergoing [pharmacogenomic/genetic] testing as part of your clinical care: (Select all that apply)

a. It adds important information to my clinical care.
b. It can improve outcomes.
c. It can help with appropriate drug selection.
d. It can help prevent drug toxicities.
e. Other (specify): _____

If no, display the following:

Which of the following best describes your reasons for not undergoing [pharmacogenomic/genetic] testing in the future as part of your clinical care? (Select all that apply)

a. It would not add anything to my clinical care
b. I do not want to know anything about my genetics
c. My health care providers do not know how to use the information properly
d. I'm concerned that the results would not be stored in a secure manner
e. My health insurance is unlikely to cover the cost and it's too expensive
f. Genetic information in my medical record may lead to problems in the future with my ability to get health insurance, etc.
g. Other (specify): _____

Would you recommend [pharmacogenomic/genetic] testing as part of a patient's clinical care?

a. Yes
b. No

If yes, display the following:

Which of the following best describes your reasons for recommending [pharmacogenomic/genetic] testing as part of a patient's clinical care: (Select all that apply)

a. It adds important information to their clinical care.
b. It can improve outcomes.
c. It can help with appropriate drug selection.
d. It can help prevent drug toxicities.
e. Other (specify): _____

If no, display the following:

Which of the following best describes your reasons for recommending against [pharmacogenomic/genetic] testing as part of a patient's clinical care? (Select all that apply)

a. It will not add anything to their clinical care
b. I'm not sure how to use the test results
c. Patients prefer not to know about their genetics
d. Other health care providers do not know how to use the information properly
e. I'm concerned that the results would not be stored in a secure manner
f. The patient's health insurance is unlikely to cover the cost and it's too expensive
g. I don't want to be liable for not knowing how to use the information to make clinical decisions
h. Other (specify): _____

Section III: Knowledge of Pharmacogenomics and Genomic Medicine

Knowledge questions for students enrolled in Clinical Applications of Pharmacogenomics:

BK is an 8-year-old male who was recently diagnosed with acute lymphoblastic leukemia. He is being started on mercaptopurine and his TPMT genotype results show his diplotype is TPMT *3A/*4. Which of the following mercaptopurine dosing recommendations would you make for BK based on his TPMT genotype?

a. Avoid mercaptopurine altogether due to increased risk of myelotoxicity; use alternative agent
b. Decrease mercaptopurine dose 10-fold and reduce frequency to three times weekly to lower risk of myelotoxicity
c. Start with reduced mercaptopurine dose (30%-70% of full dose) and monitor patient; adjust dose upward as tolerated
d. No dose adjustment is needed

For patients undergoing percutaneous coronary intervention, genetic testing for which of the following drug-metabolizing enzyme(s) has evidence of a clinical benefit to guide antiplatelet drug selection?

a. CYP2C19
b. CYP2C9
c. CYP2D6
d. A and B only
e. A, B, and C

The "clinical utility" of a pharmacogenomic test is defined as:

a. A test's ability to detect or predict the clinical disorder or phenotype associated with the genotype
b. A measure of a test's usefulness in the clinic and resulting changes in health outcomes
c. A test's ability to measure the genotype of interest accurately and reliably

AB is a 42-year-old male with chronic lower-back pain who has been receiving codeine for pain control for 3 weeks with little pain relief. His physician ordered CYP2D6 testing and results indicate that he is a poor metabolizer (CYP2D6 *4/*4). Which of the following agents could you recommend as a drug therapy alternative for AB that is not affected by this CYP2D6 phenotype?

a. Oxycodone
b. Morphine
c. Tramadol

d. Hydrocodone

Knowledge questions for students enrolled in Clinical Applications of Genomic Medicine:

A 34-year-old female of Northern European ancestry presents in your clinic with a strong family history of breast and ovarian cancer on both sides of the family. She brings along the results of her personal genomics testing that was done by a consumer-based personal genotyping company. Your patient's consumer-based personal genotyping result profile indicates she does not carry any of the 3 BRCA1 or BRCA2 mutations tested. Additionally, based on 3 other tested SNPs found to be associated with breast cancer in recent genome-wide association studies, her report reveals a risk of 9.1% compared to the average of 12.5%. What is the appropriate conclusion?

a. The patient has below-average risk but should continue regular screening measures
b. The patient has the same risk of breast cancer as the average woman of her ethnicity and should continue regular screening measures
c. The patient has above-average risk and should consider getting her BRCA1 gene sequenced
d. The patient has above-average risk and should consider getting her BRCA1 and BRCA2 genes sequenced

Genetic variation in which of the following loci have been associated with increased risk of cardiovascular disease?

a. 9p21
b. 2q33
c. CHEK2
d. 18q22
e. FGFR2

Which of the following provide resources to support evidence-based clinical-decision making in genomic medicine?

a. EGAPP
b. ClinVar
c. FDA
d. A and B only
e. A, B, and C

Which of the following is TRUE regarding family history in genomic medicine?

a. Family history has little value in predicting disease risk compared with genetic testing
b. Family history information from patients is generally unreliable, thereby limiting its use
c. An accurate family history has been linked to improved outcomes for some types of cancer
d. Most prescribers are well trained to conduct a family history and use this information to predict disease risk

<u>Section IV: Perceptions of interprofessional collaboration/education in the clinical applications of pharmacogenomic/genomic medicine</u>

Individuals in my profession understand the clinical applications of [pharmacogenomics/genomic medicine].

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I understand the role of individuals in my profession in applying [pharmacogenomic/genomic] information to patient care.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I understand the roles of other health care professionals in applying [pharmacogenomic/genomic] information to patient care.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

Successful application of [pharmacogenomic/genomic] information to patient care will require health care professionals to take a team approach.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I feel comfortable answering questions from other health care professionals about [pharmacogenomics/genomic medicine].

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I feel confident in my ability to communicate clinical recommendations regarding [pharmacogenomics/genomic medicine] to other health care professionals.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

Learning about [pharmacogenomics/genomic medicine] with students from other professions is likely to facilitate subsequent working professional relationships.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

Different health care professional students have differing views of [pharmacogenomics/genomic medicine].

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

Section V: Attitudes and Reflection on personal genotyping

Note: The following questions will be displayed for students enrolled in Clinical Applications in Pharmacogenomics who indicated that they chose NOT to undergo personal genotype evaluation.

What reasons influenced your decision to NOT undergo the personal genotyping option during this course? (Select all that apply)

a. Lack of curiosity about my genetic makeup

b. Did not want to learn about specific drugs reactions, or drug dosing that run(s) in my family or is in my DNA
c. Did not think the information from the genotyping test would be useful
d. Concerned that my data would not remain private
e. Felt it could cause me additional or unnecessary worry or stress
f. Other: _____

Of these reasons, which was the most compelling (Select one):

a. Lack of curiosity about my genetic makeup
b. Did not want to learn about specific drugs reactions, or drug dosing that run(s) in my family or is in my DNA
c. Did not think the information from the genotyping test would be useful
d. Concerned that my data would not remain private
e. Felt it could cause me additional or unnecessary worry or stress
f. Other: _____

Which of the following best reflects your feelings and beliefs toward not undergoing the personal genotyping option during this course?

a. I have significant regret that I did not undergo it
b. I have mild regret that I did not undergo it
c. My feelings are neutral
d. I am mildly pleased that I did not undergo it
e. I am significantly pleased that I did not undergo it

What was the greatest benefit you experienced by not undergoing personal genotyping?

[Freeform comment field]

What is the greatest downside you experienced by not undergoing personal genotyping?

[Freeform comment field]

I experienced anxiety when deciding whether to undergo personal genotyping.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I believe the opportunity to seek counseling from a healthcare professional (e.g. genetic counselor, clinical pharmacogeneticist, or other physician) is an important component to a personal genotyping offer.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I would have learned more from this course had I undergone personal genotyping instead of using de-identified genotype data.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

This course helped me understand what a patient's experience might be like if they chose to undergo personal genotyping.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

This course helped me understand what a patient's experience might be like if they undergo clinical pharmacogenetic testing.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I felt the professors knew whether I had undergone personal genotyping.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I felt that I was at a disadvantage in the class because the professors knew whether I had undergone personal genotyping.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

Note: The following questions will be displayed for students enrolled in Clinical Applications in Pharmacogenomics who indicated that they chose TO undergo personal genotype evaluation.

What reasons influenced your decision to undergo the personal genotyping option during this course? (Select all that apply)

a. General curiosity about my genetic makeup
b. To learn about specific drugs reactions, or drug dosing that run(s) in my family or is in my DNA
c. To learn about my pharmacogenetics without going through a physician
d. Would use it to provide information about a family members drug reaction risk/drug dosing
e. To help me understand what patients learn and experience
f. Other: _____

Of these reasons, which was the <u>most</u> compelling? (Select one)

a. General curiosity about my genetic makeup
b. To learn about specific drugs reactions, or drug dosing that run(s) in my family or is in my DNA
c. To learn about my pharmacogenetics without going through a physician
d. Would use it to provide information about a family members drug reaction risk/drug dosing
e. To help me understand what patients learn and experience
b. Other: _____

Which of the following best reflects your feelings and beliefs toward undergoing the personal genotyping option during this course?

a. I have significant regret that I underwent it
b. I have mild regret that I underwent it
c. My feelings are neutral
d. I am mildly pleased that I underwent it
e. I am significantly pleased that I underwent it

What was the greatest benefit you experienced by undergoing personal genotyping?

[Freeform Comment Field]

What is the greatest downside you experienced by undergoing personal genotyping?

[Freeform Comment field]

I experienced anxiety when deciding whether to undergo personal genotyping.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I experienced anxiety after I received my personal genotyping test results.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I believe the opportunity to seek counseling from a healthcare professional (e.g. genetic counselor, clinical pharmacogeneticist, or other physician) is an important component to a personal genotyping offer.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

Have you, or do you plan to, ask a health care professional for help in interpreting your genotyping results?

a. Yes, I already have
b. Yes, I plan to
c. No, I do not plan to

If you answered yes, which type(s) of health care professional? (Select all that apply)

a. My primary physician (e.g. Family Medicine, Internist)
b. A subspecialty physician (e.g. Cardiologist, Neurologist)
c. A geneticist
d. A genetic counselor
e. A pharmacist
f. A clinical pharmacogeneticist

What type of information have you shared or do you plan to share with a health care professional?

a. All of my results
b. Only results that would result in a change in drug dosing, drug selection, etc.
c. Only results that would NOT result in a change in drug dosing, drug selection, etc.

Have you taken any of the following actions specifically as a result of receiving your genotyping results? (Select all that apply)

a. Set up or attended an appointment with my primary care doctor
b. Discussed a medication change with my physician
c. Enacted a medication change with my physician
d. Talked with family members about my genotyping results
e. Talked with family members to learn more about my family history in regards to adverse drug reactions, abnormal drug doses, etc.
f. I have not undertaken any of these actions

For the actions you selected in the previous question, which of the following best describes your thoughts about it prior to genotyping:

a. The action(s) were things that I was already planning to do, or was actively doing
b. The action(s) were things that I had previously attempted and the genotyping results encouraged me to try again
c. The action(s) were things that I had previously contemplated but not attempted, and the genotyping results encouraged me to attempt them
d. I am in the process of collecting more information to try to decide what actions, if any, are appropriate
e. I have not taken any actions specifically as a result of my genotyping results

Based on my own experience, I would recommend pharmacogenetic testing to others

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I believe I have a better understanding of pharmacogenetics on the basis of having undergone personal genotyping

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

Undergoing personal genotyping was an important part of my learning in Clinical Applications of Pharmacogenomics.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I would have learned just as much from Clinical Applications of Pharmacogenomics had I not undergone personal genotyping and used de-identified genotype data instead.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

This course helped me understand what a patient's experience might be like if they chose to undergo personal genotyping.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

This course helped me understand what a patient's experience might be like if they undergo clinical pharmacogenetic testing.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I felt the professors knew whether I had undergone personal genotyping.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I felt that I was at a disadvantage in the class because the professors knew whether I had undergone personal genotyping.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I felt required to divulge my genotype information in order to ask questions of the professors in Clinical Applications of Pharmacogenomics.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

I felt comfortable divulging my genotype information in order to ask questions of the professors in Clinical Applications of Pharmacogenomics.

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree