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GENETICS AND GENOMICS IN NURSING PRACTICE: ASSESSING BARRIERS, FACILITATORS, AND TAILORING IMPLEMENTATION STRATEGIES

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GENETICS AND GENOMICS IN NURSING PRACTICE: ASSESSING BARRIERS, FACILITATORS, AND TAILORING IMPLEMENTATION STRATEGIES

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GENETICS AND GENOMICS IN NURSING PRACTICE: ASSESSING BARRIERS, FACILITATORS, AND TAILORING IMPLEMENTATION STRATEGIES

An Abstract of the Scholarly Project by
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The Essential Nursing Competencies and Curricula Guidelines for Genetics and Genomics were published in 2006. These guidelines define the minimal competency in genetics expected of all nurses regardless of role, specialty, or level of education. However, research indicates that nurses lack knowledge and confidence in their role in genetics/genomics.

This quality improvement project aimed to assess barriers and facilitators of genetics/genomics integration into nursing. This study followed a cross-sectional design emphasizing a representative subset of the nursing practicing community at the Veterans Healthcare System of the Ozarks. Participants were invited to complete the Genetics and Genomics in Nursing Practice Survey (GGNPS). This approach was chosen to gain insight into participants' attitudes, competence, receptivity, adoption, confidence, and social systems and their impact on genetics/genomics in nursing practice.

TABLE OF CONTENTS

TABLES……PAGE

FIGURES……PAGE

CHAPTER I

INTRODUCTION

Throughout the history of Medicine, the "one size fits all" model has undeniably reigned as superior practice. However, empirical evidence universally recognizes; that not all medications will work the same in every patient, and the dynamics of specific disease processes are recondite in others. Among the leading causes of mortality in the United States in 2005, genetic or genomic components were associated (Calzone et al., 2010). Calzone noted that heart disease, cancer, cerebrovascular disease, and diabetes represented most mortalities and have a genetic/genomic variant. In addition to mortality rates from chronic diseases, the National Library of Medicine [NLM], (n.d.) described adverse drug reactions linked to genetic disposition as a leading cause of death and hospitalizations in the United States.

Through years of research, there has been a lack of a scientific solution for predicting which patients would have these predisposing genes or reactions. However, the answer would come ahead of schedule in 2003, when the Human Genome Project (HGP) was completed (National Human Genome Research Institute [NHGRI], n.d.). The HGP "gave us the ability, for the first time, to read nature's complete genetic blueprint for building a human being" (NHGRI, n.d.). With the knowledge gained through the

HGP, researchers now have insight into differences in inherited genes and their effect on biological responses.

Description of Clinical Issue

The world of healthcare is rapidly changing through new technologies and discoveries involving genetics/genomics. Genetics/genomics have breached the realm of specialty-specific and have transcended into all spectrums of healthcare and health professions. Calzone et al. (2010) explained that nurses are essential in promoting improved patient health outcomes, quality improvement initiatives, and implementing genetics/genomics into the healthcare system. "Nurses have intimate knowledge of the patient's, families, and community's perspectives; an understanding of biologic underpinnings … skills in communication and building coalitions; and most importantly, the public's trust." (Calzone et al., 2010, para. 1). Despite significant advances in research, there remains a gap between implementing research into practice. A consistent finding in the literature is that the transfer of research findings into practice is often slow and haphazard (Graham et al., 2006). The nursing profession is a central provider of quality health care and a pivotal part in bridging the gap between efficacious research discoveries and their adoption to optimize health outcomes. Nurses require competency and confidence in genetics/genomics to provide holistic care and improve patient outcomes and are a pivotal part in bridging the gap between research and health outcomes (Calzone et al., 2010). Contrarily, research shows that nurses lack knowledge and confidence in their role in genetics/genomics.

Significance

Vastly changing health care and the increasing use of genomic information have caused a shift in the healthcare system and nursing practice. Genetic/Genomic referrals are no longer specialty dependent and have transitioned into non-specialty healthcare (Calzone et al., 2013). To further transform nursing practice, nurses must possess competence in genetics/genomics to provide quality, safe, and cost-effective healthcare (Calzone et al., 2013).

Nisselle et al. (2019) noted that "there are long-standing concerns and evidence that professionals not trained in genetics and genomics have a rudimentary knowledge of these disciplines, and are neither equipped nor confident to adopt new genomic technologies into clinical care" (para. 2). Nisselle (2019) further emphasized that education interventions in genomics are critical to improving the knowledge of healthcare professionals and integrating genomics into routine health care.

There are many evidence-based initiatives available to help facilitate the implementation of genetics/genomics into nursing practice, and most of these initiatives are led by nurses. However, the gap from research to practice, or knowledge translation, remains wide. Previous studies reveal that education initiatives alone are not enough to integrate genetics and genomics into nursing practice (Hu et al., 2018). Hu et al. (2018) also noted that a growing body of theories shows that assessing barriers and facilitators and tailoring implementation strategies is the first step in knowledge translation. Examining current practice behaviors or habits can reveal gaps between current practice and what will be required if the innovation is adopted (Graham & Logan, 2004).

Specific Purpose

The Essential Nursing Competencies and Curricula Guidelines for Genetics and Genomics were published in 2006 – and updated with outcome indicators in 2008. These guidelines define the minimal competency in genetics expected of all nurses regardless of role, specialty, or level of education (Calzone et al., 2013).

This quality improvement project assessed barriers and facilitators of genetics/genomics integration into nursing practice and, using this information, enhanced nursing knowledge in this area at VHSO.

Theoretical Framework

Innovation is defined as introducing something new or changing an existing product, idea, or field (Merriam-Webster, n.d.). Research has shown that education alone is not enough to facilitate the integration of genetics/genomics into nursing practice. In addition, an increasing number of theories emphasize that assessing barriers, facilitators, and tailoring implementation strategies are some of the most critical steps in knowledge translation (Hu et al., 2018).

The Ottawa Model of Research Use (OMRU) was a theoretical foundation for this approach. The OMRU offers a "comprehensive, interdisciplinary framework of elements that affect the process of healthcare knowledge transfer, and is derived from theories of change, from the literature, and from a process of reflection" (Graham & Logan, 2004, p. 93). Logan & Graham (1998) developed the OMRU after becoming aware of the lack of frameworks supporting research use. OMRU is a translation framework and planned change theory (Graham & Logan, 2004). The theory assumes that knowledge translation is an action and is vital in translating research into practice. For the behavioral change to

be effective, barriers and facilitators should tailor knowledge translation strategies in the setting of desired change (Logan & Graham, 1998). The model consists of six elements:

- evidenced-based innovation
- potential adopters
- practice environment
- implementation of the intervention
- adoption of the innovation
- outcomes (Graham & Logan, 2004) (Figure 1)

Several assumptions are implicit in the OMRU; patients play a crucial role in all aspects of the knowledge translation process, change is a process that takes place over time, society and health care environments will affect all aspects of the research-to-practice process and should be considered (Graham & Logan, 2004).

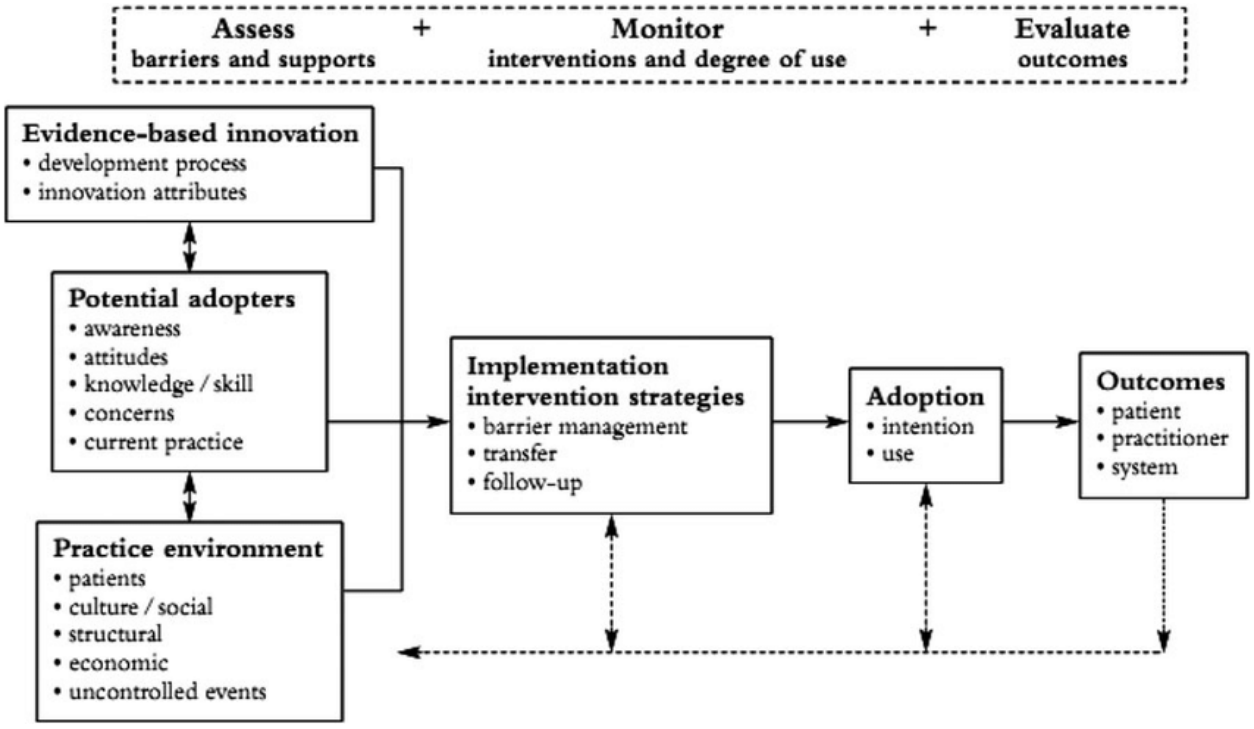


Figure 1 The Ottawa Model of Research Use (Graham & Logan, 2004)

The OMRU model uses the assess, monitor, and evaluate (AME) method throughout the knowledge translation process. This model helps identify nurses who may serve as facilitators of change "… as successful change seldom occurs spontaneously" (Graham & Logan, 2004).

Project Aims

Aim 1: Assess nurses' attitudes, receptiveness, and confidence in the adoption of genetics/genomics.

Aim 2: Assess the knowledge and competence of nurses in the adoption of genetics/genomics.

Aim 3: Evaluate barriers and facilitators of genetics/genomics integration into nursing practice.

Definition of Key Terms/Variables

The following are key terms and variables are defined for clarification and understanding:

Barriers: a lack of awareness of the innovation, attitudes towards the change or innovation, concerns about the proposed change, intentions to adopt or use the innovation, and current practices or habits (Graham & Logan, 2004)

Common diseases: those that most frequently affect us and are often those with which we are most familiar, i.e., heart disease, cancer, cerebrovascular disease, and diabetes

Facilitators: person or thing that makes something easy or easier or "supports" (Graham & Logan, 2004)

Genetics: "study of genes and how certain traits or conditions are passed down from one generation to another" (NHGRI, n.d.)

Genomics: “study of all of a person's genes (the genome)” (NHGRI, n.d.)

Innovation: introduction of something new or a change made to an existing product, idea, or field (Merriam-Webster, n.d.)

Knowledge translation or knowledge transfer:

> exchange, synthesis, and ethically sound application of knowledge—within a complex system of interactions among researchers and users—to accelerate the capture of the benefits of research … through improved health, more effective services and products, and a strengthened health care system. (Davis et al. 2003).

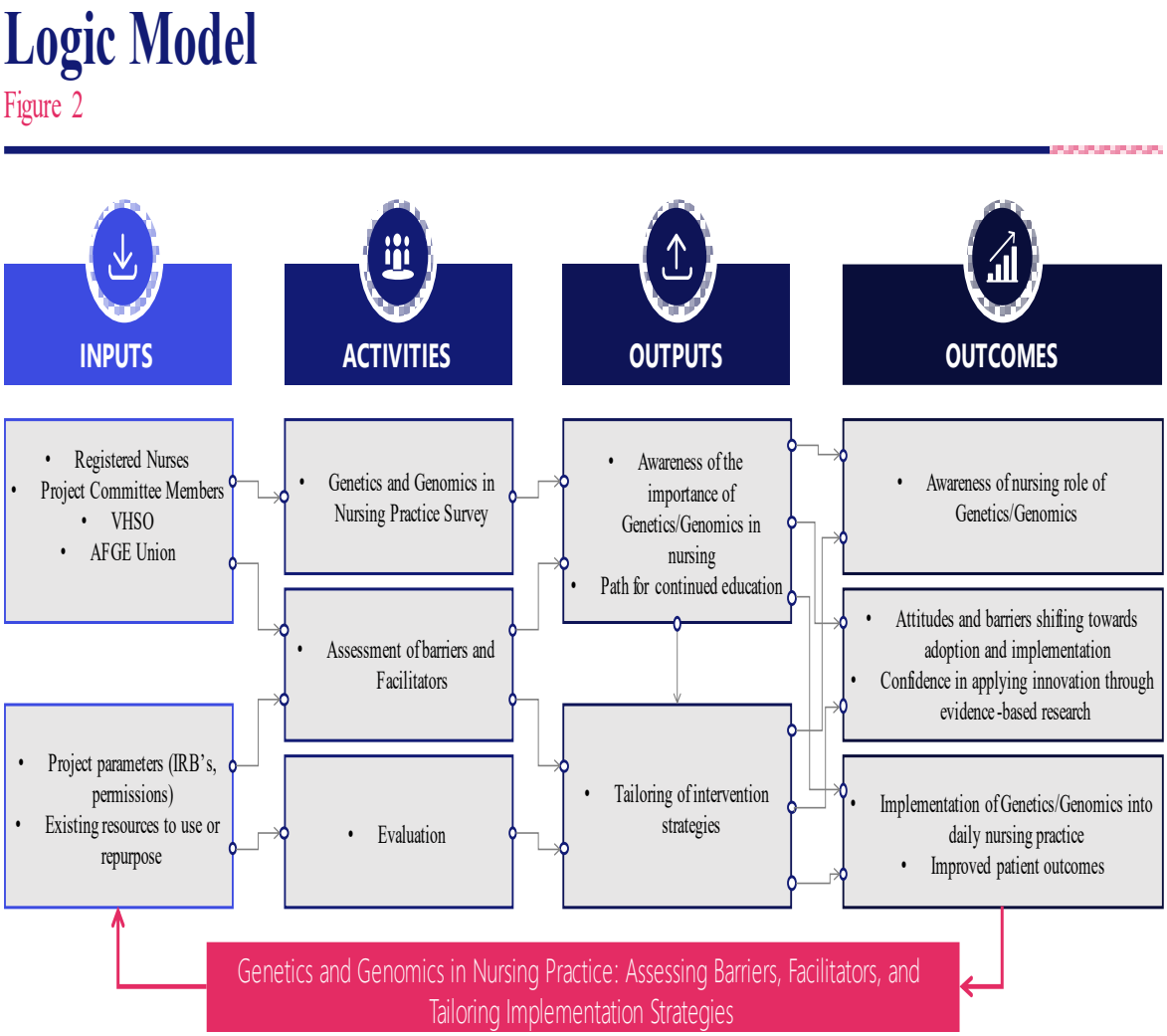
Nurses: registered nurses (RNs) from all levels of academic preparation and roles (Calzone et al., 2012)

Senior staff: nurse executive or nurse administrator in the top nursing management position in the medical center or health care system and the PENTAD (Executive Leadership Team) consisting of the Director, Associate Director, Chief of Staff, & Associate Chief of Staff)

Social systems: setting or environment where the innovation was introduced, such as the clinical site [or health care system] where nurses are employed (Calzone et al., 2012)

Logic Model

The logic model (Figure 2) demonstrates the project inputs, activities, and outcomes. The short-term goals were to be aware of genetics and genomics in nursing practice and assess barriers and facilitators using the GGNPS. The long-term goals are to adopt genetics and genomics into daily nursing practice and improve patient outcomes. The long-term goals were unable to be assessed due to time limitations.



Summary

Throughout the history of medicine, the “one size fits all” model has undeniably reigned as superior practice. However, research disproves this vintage philosophy. There is a universal understanding that medications react differently in different patients.

Genetics/genomics have breached the realm of specialty-specific and have transcended into all spectrums of healthcare and health professions. Nurses are essential in implementing genetics/genomics into the healthcare system. Despite significant advances in research, there remains a gap between implementing research into practice and nurses’ lack the knowledge and confidence in their role in genetics/genomics.

This project aimed to assess barriers and facilitators of genetics/genomics integration into nursing practice. This project utilized a descriptive study design and convenience sampling of registered nurses (RNs) from the Department of Veterans Affairs of the Ozarks. The nursing profession is a central provider of quality health care and a pivotal part in bridging the gap between efficacious research discoveries and their adoption. Assessing barriers and facilitators of innovations is vital to successful implementation at VHSO. The information gained through this quality improvement project can be utilized to create clinical competencies in addition to continuing education and policy initiatives.

CHAPTER II

REVIEW OF LITERATURE

This investigator performed an integrated literature review to assess genetics/genomics in nursing practice. Online databases including Cochrane Library, Google Scholar, PubMed, CDC, and MEDLINE were used to search keywords; genetics, genomics, nursing, pharmacogenetics, and genomic medicine. Additional search criteria included articles within the last ten years. This study assessed barriers and facilitators of integrating genetics/genomics into nursing practice. Healio (2015) described genetics as a scientific study of genes' effects on an individual, while genomics is how the genes within a genome interact with each other and the individual's environment. The field of Medicine has witnessed significant advancements in genetics/genomics. The HGP brought genetics/genomics to the forefront of Medicine and created a paradigm shift. The progressive advances in genetics/genomics have breached every spectrum of healthcare, regardless of role, specialty, or education.

Direct-to-consumer genetic testing is a growing trend among the public and persists without a healthcare provider's input (Badzek et al., 2013). Nurses play critical roles in incorporating genetic and genomic information into the healthcare landscape. Health promotion and disease prevention are integral components of genetic/genomic health care practices. Conversely, nurses' lack of knowledge and confidence challenge

their readiness to translate, manage, and navigate genetic information and education provision is inconsistent (Badzek et al., 2013; Calzone et al., 2018). “Regardless of the practice area, nurses are now responsible for developing the knowledge, skills, attitudes required by the genomic era” (Quigley, 2015, para. 2).

The Human Genome Project

The NHGRI (n.d.) described the Human Genome Project (HGP) as the international, collaborative research program whose goal was the complete mapping and understanding of all the genes (or genome) of human beings:

> HGP researchers deciphered the human genome in three significant ways: determining the order, or "sequence," of all the bases in our genome's DNA; making maps that show the locations of genes for significant sections of all our chromosomes; producing what is called linkage maps. Linkage maps can track inherited traits (such as those for genetic disease) over generations.

The NHGRI (n.d.) proclaimed that HGP gave researchers, for the first time, the ability to read nature's complete genetic blueprint for building a human being. The NHGRI (n.d.) further emphasized that the information provided through the HGP is the "basic set of inheritable instructions" for the development and function of a human being:

> It's a history book - a narrative of the journey of our species through time. It's a shop manual with an incredibly detailed blueprint for building every human cell. And it's a transformative textbook of Medicine with insights that will give health care providers immense new powers to treat, prevent and cure disease.

However, information is only as good as the ability to use it, and disseminating the information obtained from the HGP into a vast healthcare system has been inefficient.

Family History

There has been substantial scientific progress since the completion of the HGP. This quick progress of genetic/genomic science significantly influenced screening, diagnosis, treatment, and prevention of disease and monitoring therapy effectiveness (Hu et al., 2018). These breakthrough developments are arguably the holy grail of genetics/genomics; however, a more simple, readily available, and affordable genomic tool remains underutilized; the family history. Research has shown that the top major chronic diseases in the United States and public health significance have a genetic component. Moreover, people with a family history of the disease have a higher risk of developing the disease than people without a family history. That family history can inform clinical decision-making, preventive services, and age-related screenings (Lushniak, 2015).

In 2004, former Surgeon General Dr. Richard Carmona launched the Surgeon Generals Family History Initiative:

> This initiative is a national campaign to help families learn more about their family health history. It provides a free Web-based tool, My Family Health Portrait, to enable people to collect, organize, and record their family health information. To highlight the importance of this initiative, Dr. Carmona and later Surgeons General have declared Thanksgiving is Family Health History Day. (Lushniak, 2015, para 2).

Most people have a family history of at least one common disease (e.g., cancer, diabetes, heart disease, osteoporosis) or health condition (e.g., hypertension, lipid disorders) (Center for Disease Control and Prevention [CDC], n.d.). Preventative service

recommendations incorporating family history can improve health outcomes for those with higher risks. Lushniak (2015) discussed the ongoing development of "next-generation genome sequencing" for chronic diseases and noted that earlier studies suggest that they will likely "complement rather than replace family health history."

Family history gives information about genes and environmental and behavioral risk factors shared among family members (Lushniak, 2015). Diabetes Mellitus Type 2 (DMT2) is one of the most common chronic diseases in the United States – an estimated 30 million people suffer from this disease. DMT2 is considered a complex disease as its development depends on a person's genetic disposition, lifestyle, and environment (Ganguly, 2019).

According to the NLM (2021), a complete family history record includes information from three generations: children, brothers, sisters, parents, aunts, uncles, nieces, nephews, grandparents, and cousins.

Nursing in the Genetic/Genomic Era

Genetics/Genomics are changing and influencing all aspects of the healthcare continuum, thus changing the nursing profession (Calzone et al., 2012). Nurses represent the largest contingent of health care providers globally and deliver quality healthcare across the life span. Nurses are essential in closing the gap between discoveries and healthcare and are expected to acquire the knowledge and skills to apply new genetic and genomic technologies (Hu et al., 2018). Hu et al. (2018) further detailed that the implications of genetics/genomics to the nursing practice are long-standing, yet few initiatives are established for integration. Although genetics/genomics elevates nursing culture, research reveals limited progress in integrating genetics and genomics into

nursing practice. Nurses are the most trusted healthcare professionals and can facilitate the translation of genomics into health care; however, evidence exists that nurses have limited genetic competency (Calzone et al., 2012).

The Essential Nursing Competencies and Curricula Guidelines for Genetics and Genomics were published in 2006 – and updated with outcomes indicators in 2008. In 2012, The Essential Nursing Competencies and Curricula Guidelines for Graduate Nurses were published. These guidelines define the minimal competency in genetics expected of all nurses regardless of role, specialty, or level of education (Calzone et al., 2013). Calzone et al. (2013) note that 50 nursing organizations have endorsed competencies. These guidelines established the minimal criteria for competency in genetics/genomics for the nursing profession and provided nursing with a framework for identifying the educational needs of nurses (Calzone et al., 2012).

The Essentials of Genetic and Genomic Nursing: Competencies, Curricula Guidelines, and Outcome Indicators (2009) consist of a minimum of twenty-five genetic/genomic competencies expected of all registered nurses regardless of academic preparation, practice setting, or role, or specialty.

Domain: Professional Responsibilities

- Recognize when one's attitudes and values related to genetic and genomic science may affect the care provided to clients.

Domain: Professional Practice Essential Competency

Nursing Assessment: Applying/Integrating Genetic and Genomic Knowledge:

- Nurses demonstrate an understanding of the relationship between genetics and genomics to health, prevention, screening, diagnostics, prognostics, selection of

treatment, and monitoring of treatment effectiveness.

Domain: Professional Practice Essential Competency

Identification:

- Based on assessment data, identifies clients who may benefit from specific genetic and genomic information and services.

Domain: Professional Practice Essential Competency

Referral Activities:

- Facilitates referrals for specialized genetic and genomic services for clients as needed.

Domain: Professional Practice Essential Competency

Provision of Education, Care, and Support:

- Nurses provide clients with the interpretation of selective genetic and genomic information or services.

The Essentials of Genetic and Genomic Competencies for Nurses with Graduate Degrees (2012) includes thirty-eight competencies that build on the original *Essentials* document. All graduate nurses expect competencies regardless of academic preparation, practice setting, role, or specialty.

I Professional Practice

Risk Assessment and Interpretation:

- The nurse with a graduate degree engages in a more active role in risk assessment and interpretation than the registered nurse without a graduate degree. Advanced Practice Registered Nurses (APRN) perform a more detailed evaluation, gather an expanded history, assess for modifiers of risk, confirm reported family health

histories, ensure that histories are updated, integrate psychosocial aspects of the family history, and assess for other complex variables (e.g., consanguinity within a family pedigree).

Genetic Education, Counseling, Testing, and Results Interpretation:

- Nurses with graduate degrees provide genetic/genomic education, counseling and testing, and client support throughout the lifespan within their licensure, scope of practice, and clinical setting, and seek consultation as appropriate.

Clinical Management:

- Nurses with graduate degrees need to provide personalized care and coordination by incorporating genetic/genomic-based technology into client care.

Ethical, Legal, and Social Implications (ELSI):

- Nurses with graduate degrees need to recognize the significance of ethical, legal, and social implications in genetics and genomics. Genetic testing is a component of health care where ethical issues may be most apparent, although ethical, legal, and social implications apply across all practice areas.

II Professional Responsibilities

Professional Role:

- To provide safe and competent care to clients, nurses with graduate degrees need to maintain a solid foundation in genetics/genomics.

Leadership:

- Nurses with graduate degrees assume an active role in genetic/genomic policies at the local, state, national, and international levels in nursing and other health care organizations.

Research:

- Nurses with graduate degrees must understand how genetic/genomics research can provide insight into human biology and disease pathogenesis, leading to improved health outcomes. Nurses prepared at the doctoral level are expected to provide leadership in conducting research and translating genetic/genomic findings into practice.

Assessing Knowledge and Attitudes

Since completing the HGP, genetics/genomics technology and discoveries have significantly influenced the healthcare field. Genetics and genomics have breached specialty-specific practice and are transcending into non-specialty practice. Nurses are well-positioned to translate research into practice; however, evidence reveals a lack of genetic literacy.

Selah et al. (2019) conducted a study to identify the perceived knowledge and education needs of nurses, midwives, and allied health professionals who provided psychological care to patients with genetic disorders. The authors previously established that the study participants lacked adequate knowledge, skills, and confidence; however, they aimed to assess a more diverse group. This study revealed that participants were eager to learn about genetics/genomics but were unsure of reliable sources (Selah et al., 2019).

Godino et al. (2012) sought to understand the knowledge and attitudes of nurses toward genetic health care. Godino et al. (2012) concluded that 102 nurses and midwives completed questionnaires; 61% believed that genetic counseling was only an informatory and advisory process, 53.9% could not identify patients to refer to genetic counseling;

additionally, 62% of nurses responded they had no role in genetic healthcare, and 28% believed that nurses could provide information, support, and counseling.

To inform education efforts, Calzone et al. (2013) examined nursing attitudes, receptivity, confidence, competency, knowledge, and practice in genomics. Six hundred & nineteen registered nurses participated in the study, with the most considerable portion of the education level being baccalaureate-prepared nurses. Results showed that 67.5% considered genomics very important to nursing practice; however, 57% reported their genomic knowledge base to be fair or poor. In addition, 64% of respondents had never heard of the Essential Nursing Competencies and Curricula Guidelines in Genetics/Genomics (Calzone et al., 2013).

Nursing leaders also lack the preparation to guide nurses in translating genetic information to patient care. Badzek et al. (2013) administered a survey during the 2010 House of Delegates' meeting, representing nurse leaders across the United States. Badzek et al. (2013) desired to inform and continue initiatives related to genomics. Of the 244 delegates, the primary nursing role identified was education; the majority felt that genomics was very or somewhat important to nursing and believed family history was a key component; however, many incorrectly identified core elements of family history collection (Badzek et al., 2013).

Barriers to Genetics and Genomics in Nursing

The Essentials for genetic and genomics are well defined although not well disseminated. Research reveals that nurses across all educational and professional levels lack the knowledge, skills, and confidence to integrate genetics/genomics into nursing practice.

Calzone et al. (2018) identified critical challenges to clinical practice and nurse education regarding genetics/genomics. The researchers noted some of the most significant challenges or barriers to clinical integration were limited access to resources, lack of expertise, and little training. Calzone et al. further noted some of the education challenges and obstacles were insufficient curriculum time and the number of educators able to teach genomics. Jenkins and Calzone (2014) described nursing workforce size and diversity as barriers to integrating genetic/genomics into healthcare.

Summary

This chapter focused on evidence-based literature relating to genetics/genomics in nursing practice. The reviewed literature identified gaps in nursing knowledge, confidence, and skills regarding genetics/genomics. Additional literature revealed the same gap among nurse leaders. The Essentials of Genetic and Genomic Nursing provides commentaries and guidelines for nurses of all levels of education and professional background.

CHAPTER III

METHODOLOGY

This chapter will discuss the research design for this project. Sample and sampling methods, instruments utilized, and procedures will be detailed in addition to statistical analysis and protection of human subjects. The Essential Nursing Competencies and Curricula Guidelines for Genetics and Genomics were published in 2006 – and updated with outcome indicators in 2008. These guidelines define the minimal competency in genetics expected of all nurses regardless of role, specialty, or level of education (Calzone et al., 2013).

Genetic/genomic referrals are no longer specialty dependent and have transitioned into non-specialty health care. Nurses must possess the competence in genetics/genomics to provide quality health care, both safe and cost-effective. This project assessed barriers and facilitators of genetics and genomics integration into nursing practice. A descriptive research design evaluated barriers and facilitators of genetics/genomics and implementation strategies.

Design

This study followed a cross-sectional design emphasizing a representative subset of the nursing practicing community. Participants were invited to complete the Genetics and Genomics in Nursing Practice Survey (GGNPS). This design approach was chosen to

gain insight into participant attitudes, receptivity, confidence, adoption, and social systems; and their impact on genetics/genomics in nursing practice.

Demographic data were collected on the GGNPS and protected, although this was with some limitations. Data collection began after Institutional Review Board IRB) approval from the Veterans Healthcare System of the Ozarks and Pittsburg State University. Prior to survey distribution, it was revealed that a mandatory Union approval would be needed. This principal investigator applied for exempt status as no identifiable information was obtained (directly or indirectly). This study did not manipulate variables or administer interventions. There were no anticipated risks to participants during this study.

Sample

The participants of this study were recruited through a convenience sample of registered nurses (RNs) currently employed at the VHSO. RNs of all academic backgrounds were eligible to participate. Participants were included in the study if they were 18 years or older, currently licensed as a registered nurse, and presently employed by the Veterans Healthcare System of the Ozarks. Participants who were not currently employed by the Veterans Healthcare System of the Ozarks**,** licensed practical or vocational nurses, and not presently licensed as registered nurses were excluded from the study.

Participants' rights were protected throughout this project. Participants were also advised that there were no consequences for withdrawal from the study. No participant identifiers were collected.

Protection of Human Subjects

Several methods were put in place to ensure the protection of human subjects. IRB approval was obtained from the Veterans Healthcare System of the Ozarks and Pittsburg State University before data collection. Subject participants were informed of the purpose of this study before and after launching the survey. Assurances on anonymity and exclusion of personal identifiers were provided. Participants were also advised that there were no potential consequences for participating or refusing to participate in this study. Data was stored in a password-protected file and viewable only by the principal investigator and committee members.

Instrumentation

The Genetics and Genomics in Nursing Practice Survey (GGNPS) was the primary instrument to assess participants' attitudes, receptivity, confidence, adoption, and social system. The principal investigator used this tool to gain insight into barriers and facilitators of genetics/genomics integration into nursing practice. For the behavioral change to be effective, barriers and facilitators should tailor knowledge translation strategies in the setting of desired change (Logan & Graham, 1998).

The GGNPS is discipline-specific and derived from a validated instrument initially designed to assess family physicians' genetic/genomic competency factors (FP). Researchers used the FP instrument to evaluate components of Rogers Diffusion of Innovations (DOI) domains: attitudes, knowledge, confidence, competency, confidence, adoption, and social systems (Calzone et al., 2010). Researchers developed the FP instrument through an interdisciplinary collaboration of genetic/genomics experts, behavioral scientists, survey designers, and family physicians. The FP instrument was

validated using a structured equation model (SEM) to evaluate survey item alignment with DOI domains and the direction of the association. According to Calzone et al. (2010), the findings indicated that the items aligned with the DOI domains.

The GGNPS, designed by Kathleen Calzone and colleagues, is a modified version of the original FP instrument with adjustments for nursing practice. Nurses and nursing experts were consulted for evaluation and recommendations. The GGNPS was then thoroughly evaluated for a nursing scope of practice, alignment with nursing genomic competencies, and content validity (Calzone et al., 2012). Content experts reviewed the proposed instrument for suggestions and feedback.

The GGNPS was amended after pilot testing before implementation. Researchers made additional revisions after conducting reliability testing through participating institutions in the Method for Introducing a New Competency (MINC): Genomics into Nursing Practice study (Calzone et al., 2014).

The purpose of the MINC study was to develop, implement, and evaluate a year-long genomic education intervention. The education intervention trained, supported, and supervised institutional administrators and "Champions." The MINC study sought to increase nursing capacity to integrate genetics/genomics into nursing practice (NGHRI, n.d.).

The most recent revised instrument includes eight sections covering five domains containing nominal and ordinal questions. On November 2, 2020, the principal investigator sent an email to survey developer Kathleen Calzone requesting permission to duplicate the GGNPS for the DNP Project.

The GGNPS domains are based on constructs of Roger's Diffusion of Innovation (DOI) theory:

- Attitudes
- Receptivity
- Confidence
- Social system
- Adoption

The GGNPS contains nominal and ordinal questions:

- select all that apply
- multiple choice
- yes/no
- true/false
- Likert scales

Procedure

This principal investigator obtained Institutional Review Board approval from the Veterans Healthcare System of the Ozarks and Pittsburg State University before data collection began. Data was not collected until approvals were granted. An email was sent to the VHSO registered nurses informing them of the survey. The email invitation included a link to the survey, log-in information, estimated completion time, and the deadline for a survey response. The GGNPS was administered using Survey Monkey. The email link took participants to the first page of the survey and explained the purpose of the study. Participants were informed that the information provided was voluntary and anonymous. Participants were also be advised that the survey may be stopped at any time

and that there were no consequences for withdrawing from the study. The survey remained open for three weeks.

The study involved minimum risk, and no harm or risks to participants were expected. Data were collected and stored in a password-protected file only accessible by the principal investigator and committee members. After three years, all data collected during this study will be destroyed.

Data Analysis

Data were extracted into a password-protected Microsoft Excel database for analysis. Descriptive statical techniques were used to analyze demographic data and GGNPS responses. Collected data was tabulated and calculated to form knowledge scores. Items in the attitudes, receptivity, confidence, social system and adoption domains were analyzed individually and were not combined to form the knowledge scores. The data obtained through this project can assist with tailoring strategies to implement genetics/genomics in nursing practice.

Summary

This project utilized a descriptive study design and convenience sampling of registered nurses (RNs) from the Veterans Healthcare System of the Ozarks. Participants who met inclusion criteria were invited to participate in the Genetics and Genomics in Nursing Practice Survey (GGNPS). This study aimed to assess barriers and facilitators of genetics/genomics integration into nursing practice. Assessing barriers and facilitators of innovations is key to successful implementation.

CHAPTER IV

RESULTS

Genetic/Genomic referrals are no longer specialty dependent and have transitioned into non-specialty health care. Nurses must possess competence in genetics/genomics to provide quality health care safe and cost-effective.

This project aimed to assess barriers and facilitators of genetics/genomics integration into nursing practice. This project utilized a descriptive study design and convenience sampling of registered nurses (RNs) from the Veterans Healthcare System of the Ozarks. The nursing profession is a central provider of quality health care and a pivotal part in bridging the gap between efficacious research discoveries and their adoption. Assessing barriers and facilitators of innovations is vital to successful implementation at VHSO. The information gained through this quality improvement project can be utilized to create clinical competencies, continuing education, and policy initiatives.

Description of Population

The sample consisted of registered nurses (RNs) currently employed at the Veteran Healthcare System of the Ozarks. Data collection began after approval from the IRB subcommittee, the full VHSO Research and Development committee, and Pittsburg State University. Data collection started on January 31, 2022, three weeks after initial

approval, due to oversight of mandatory acceptance or declination from the American Federation of Government Employees (AFGE) or Union. The Union approved the survey on January 31, 2022, and data collection concluded with 30 survey respondents, which coincided with the survey closure on February 21, 2022. Survey invitations were sent via email to a convenience sample of RNs employed at the Veteran's Hospital in Fayetteville, Arkansas, and the Gene Taylor Community-based Outpatient Clinic (CBOC) in Springfield, MO. RNs of all academic backgrounds were eligible to participate, and participation was voluntary.

The total number of RNs listed in an email group was obtained through Outlook and verified with the Office of Nursing Resources. Two hundred twelve emails were initially sent out, with 26 emails not delivered, resulting in 186 survey emails. Demographic data collected went through two edits per request of the Union. Data left included American Nurse Association affiliation, student status, number of years in nursing, primary functional area, percentage of work-time spent with patients, the current scope of practice or expertise, and highest degree. The participant's year of birth, gender, and race or ethnic identifiers were omitted.

In response to the question, *"Highest level of nursing education" (n=25)* 36% (n=9) had an Associate's degree, 24% (n=6) bachelor's degrees, 36% (n=9) Master's degree, and 4% (n=1) Doctorate degree. In response to the question, *"Primary functional area" (n=26)* 80.77% (n=21) reported patient care, 15.4% (n=4) administration, 3.9% (n=1) education, and 3.9% (n=1) reported other, however area was not specified. In response to the question, *"Primary area of practice or expertise" (n=26)* 57.7% (n=15) reported Staff Nurse, 23.1% (n=6) Nurse Practitioner, 11.5% (n=3) Care Manager, 3.9%

(n=1) Head Nurse, 3.9% (n=1) Clinical Nurse Specialist, 3.9% (n=1) Supervisor, and 3.9% (n=1) Educator. In response to question, *"Portion of time spent seeing patients" (n=23)* the median range was 83.3%. There were 15.4% (n=4/26) participants who responded "Yes" to current student status, while 84.6% (n=22/26) responded "No." to student status. Forty-two percent (n=11/26) responded "Yes" to American Nurse Association Membership, however 57.7% (n=15/26) responded "No." Demographic data presented in Table 1.

There was a median range of 24 "*Years worked in nursing" (n=24),* with five years the shortest and 42 years the longest.

Table 1.
Demographic Data
(n=30)

Characteristic	*n*	yr.	%
Degree			
Associate's	9		36
Baccalaureate	6		24
Master's	9		36
Doctorate	1		4
Primary Functional Area			
Administration	4		15.38
Education	1		3.85
Patient Care	21		80.77
Other	1		3.85
Primary Practice Area			
Staff Nurse	15		57.69
Head Nurse	1		3.85
Nurse Practitioner	6		23.08
Clinical Nurse Specialist	1		3.85
Educator	1		3.85
Supervisor	1		3.85
Care Manager	3		11.54
Years in Nursing			
	24		
Median (range)		24 (0.5-50 yrs.)	
The portion of Time Spent seeing Patients.			
	23		
Median (range)			83.26% (0-100%)
Student			
Yes	4		15.38
No	22		84.62
American Nurse Association Member			
Yes	11		42.31
No	15		57.69

Analyses of Project Aims

Aim 1: Assess nurses' attitudes, receptiveness, and confidence in adopting genetics/genomics.

Attitudes and Receptivity (n=30)

Fifty-three percent (n=16) agree that it is very important for nurses to become educated about the genetics of common diseases; moreover, 26.7% (n=8) felt it was extremely important. Only 20% (n=6) felt that educating nurses on the genetics of common diseases was somewhat important. Ninety percent (n=27) of respondents perceived the integration of genetics into nursing practice as an advantage in better treatment decisions and retooling professionally (47%).

Confidence (n=29)

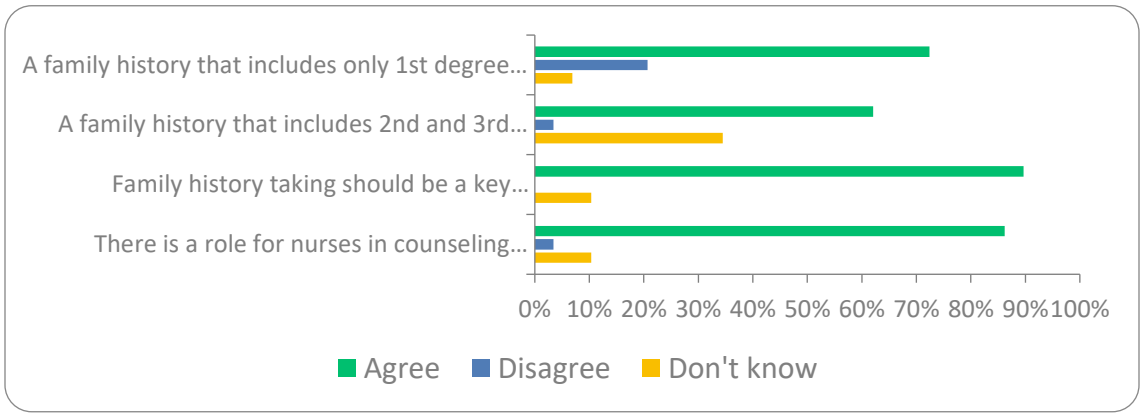
Seventy-nine percent (n=23) of respondents reported being confident in deciding what family history information is needed to identify genetic susceptibility to common diseases. At the same time, 21% (n=6) said there were not confident at all. There was an equal response to confidence discussing how family history affects recommended screening intervals, with 79% (n=23) reporting confidence and 21% (n=6) saying not confident. However, there were differences noted in questions regarding accessing and providing genetic information. Only fifty-two percent (n=15) were optimistic about accessing reliable and current information on genetics and common diseases, while 48% (n=14) were not confident. Even fewer, 34% (n=10), felt satisfied giving patients information about the risks, benefits, and limitations of genetic testing for common diseases. Similarly, 48% (n=14) reported they were not confident.

Aim 2: Assess the knowledge and competency of nurses in the adoption of genetics/genomics.

Knowledge and Competency (n=28)

Fourteen percent (n=4) of survey respondents had heard of or read about the Essential Nursing Competencies and Curricula Guidelines in Genomics, compared to 86% (n=24) that did not know the Competencies.

Q4. Please indicate whether you agree or disagree with the following statements. (n=29)

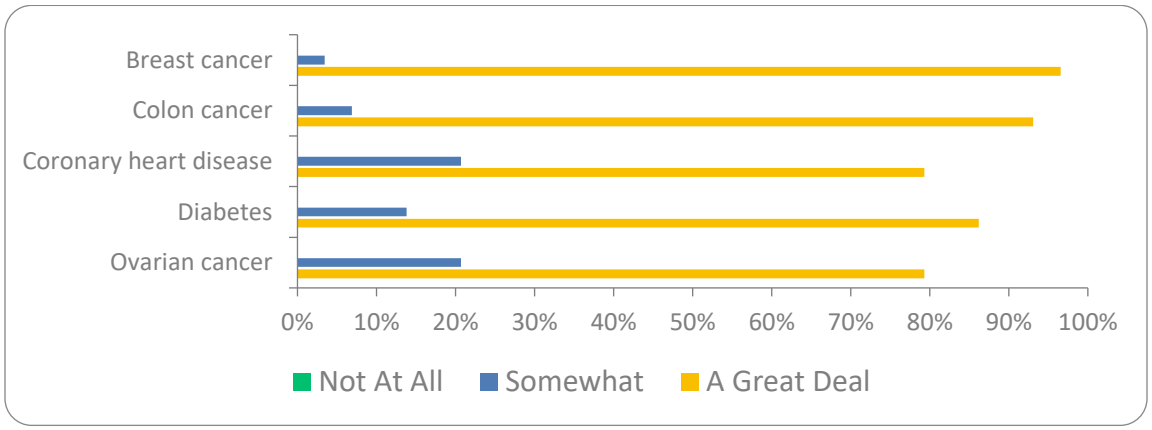


Seventy-two percent (n=21) of respondents incorrectly identified that family history, only including 1st-degree relatives, should be taken on all new patients, while 21% (n=6) correctly disagreed and 7% (n=2) reported: "Don't Know." In addition, 62% (n=18) correctly identified that family history should include 2nd and 3rd-degree relatives, compared to 35% (n=10) that responded "Don't Know" and 3.5% (n=1) who incorrectly disagreed. Knowledge questions answered "Don't Know" were also scored as incorrect.

Ninety percent (n=26) correctly agreed that family history should be a key component of nursing care, and only 10% (n=3) reported: "Don't Know." No one disagreed with this statement. Most 86% (n=25) correctly agreed that nurses have a role

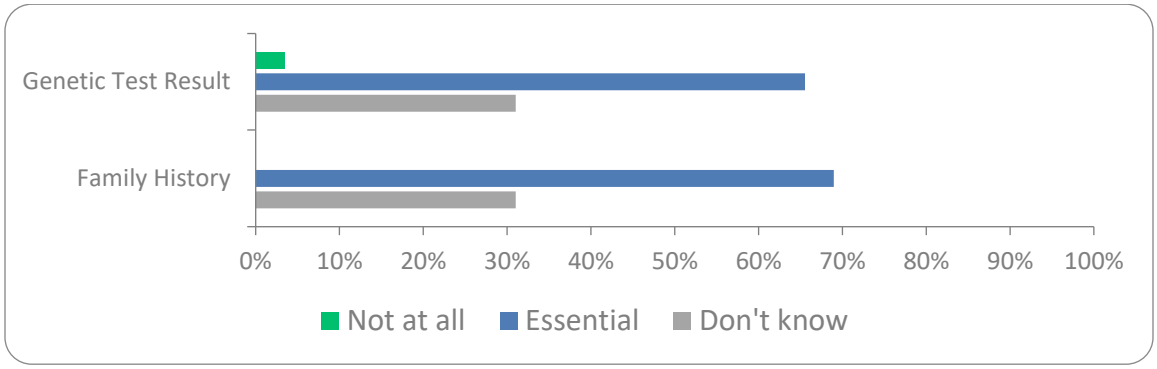
in counseling patients about genetic risks, while 10% reported "Don't Know," and only 3.5% (n=1) of respondents disagreed, which was scored as incorrect.

Q9. Do you think genetic risk (e.g., as indicated by family history) has clinical relevance for the following? (n=29)



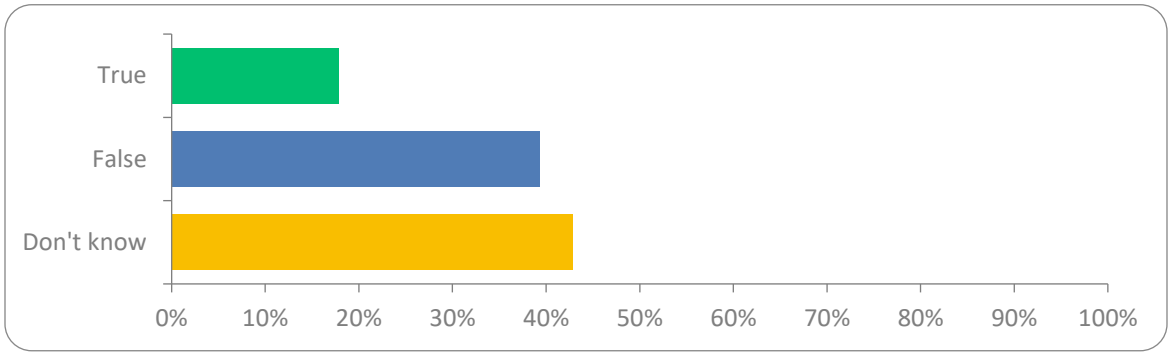
Most respondents correctly identified genetic risk as having a great deal of clinical relevance for breast cancer (97%, n=28), colon cancer (93%, n= 27), coronary artery disease (79%, n=23), diabetes (86%, n=25, and ovarian cancer (79%, n=23). Although, there was a median range of thirty-three percent (n=19) of respondents who felt that genetic risk had somewhat clinical relevance to common diseases. Participants that responded "somewhat" were scored as correct. No one responded, "Not at All."

Q11. Thinking about how you support clinical decisions (such as administering drugs prescribed), how important do you think each of the following is to consider? (n=29)



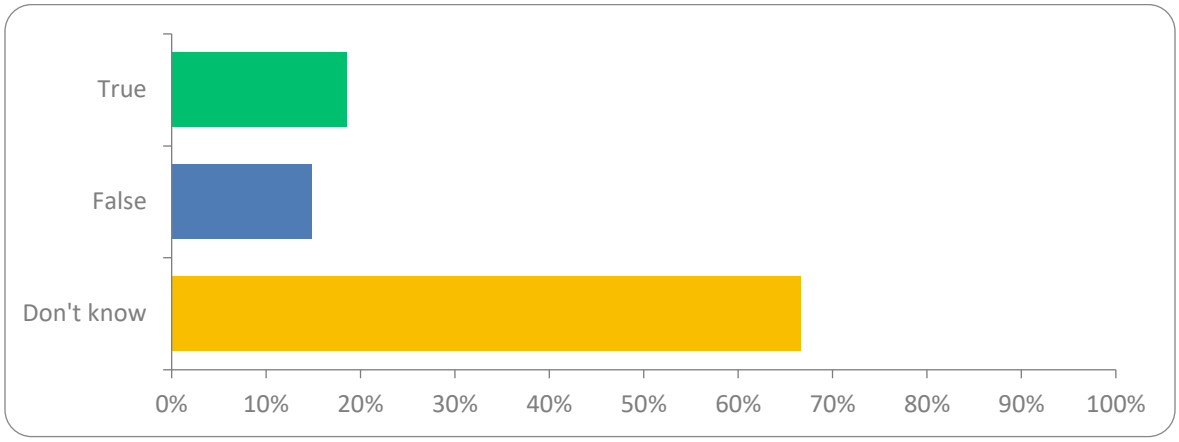
Sixty-six (n=19) of respondents correctly reported that genetic test results were essential to clinical decision making; 31% (n=9) responded: "Don't Know," while 3.5% (n=1) selected "Not at All," Again, "Don't Know" and "Not at All" were scored as incorrect. Furthermore, family history was considered essential in clinical decision-making among 69% (n=20) of respondents, and 31% (n=9) reported: "Don't Know." No one said family history was "Not at All" important.

Q12. The DNA sequences of two randomly selected healthy individuals of the same sex are 90-95% identical. (n=28)



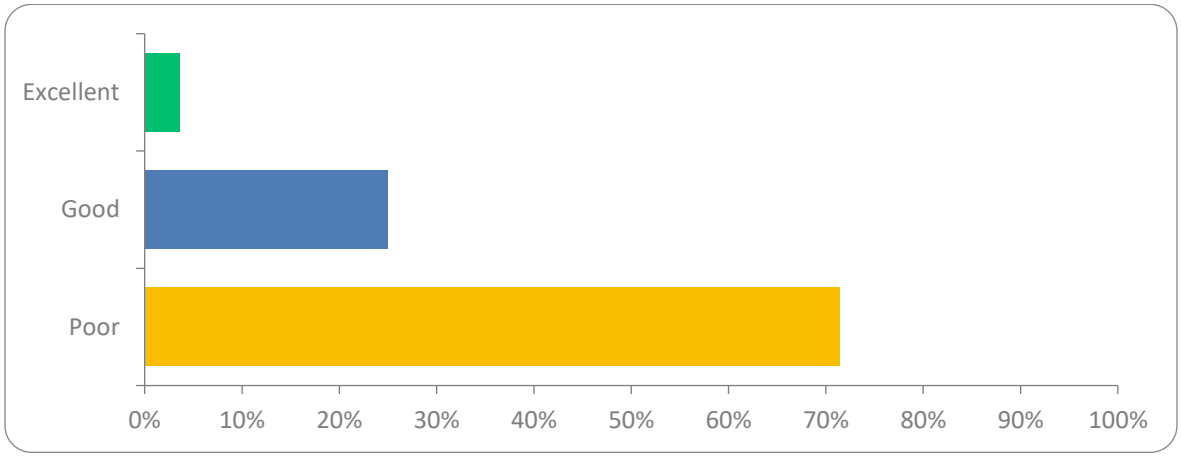
In response to random individuals of the same sex having identical DNA sequences, 39% (n=11) of respondents reported "False," 18% (n=5) "True," and 43% "Don't Know." The correct scoring answer was "False."

Q13. A single gene variant causes the most common diabetes and heart disease. (n=27)



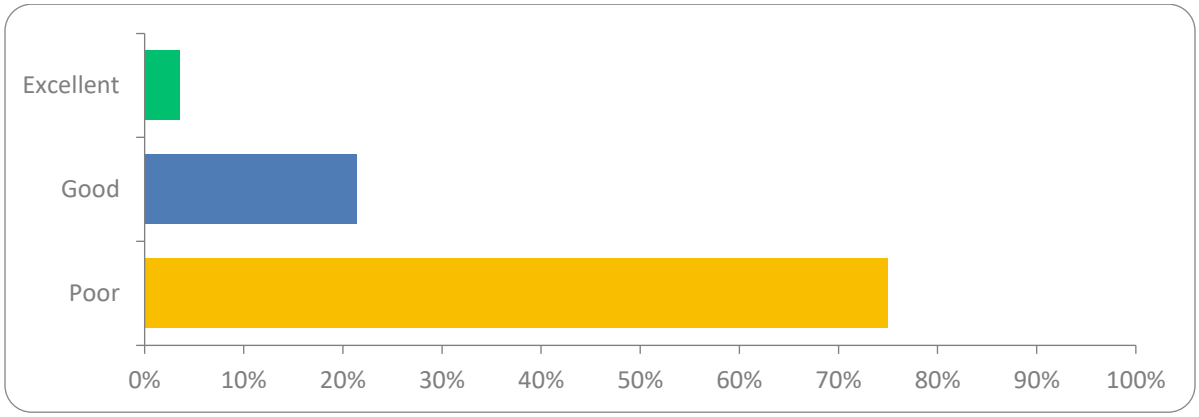
In response to a single gene variant causing common diseases, such as diabetes and heart disease, 19% (n=5) responded “True, which is the incorrect response,” 15% (n=4) “False.” while the most significant number of respondents, 67% (n=18) were “Don’t Know.” The correct scoring answer was “False.”

Q15. Please rate your understanding of the genetics of common diseases (n=28).



Only 3.6% (n=1) of respondents reported their understanding of the genetics of common diseases as excellent, compared to 25% (n=7) who felt their knowledge was exemplary. Most 71% (n=20) reported their knowledge was poor.

Q16. In describing your genetic/genomic knowledge, what would you consider it? (n=28)



Comparably, 3.6% (n=1) of respondents described their genetic/genomic knowledge as excellent, while 21% (n=6) reported good and 75% (n=21) poor. The data obtained from Q15 and Q16 correlates with respondents' reported knowledge of the *Essential in Genetics Competencies*.

Table 2.

Total Knowledge Score Items (n=30)

Item	Correct Response	Incorrect Response
Q4. A family history that includes **only** the 1st-degree relatives such as parents, siblings, and children should be taken on every new patient.	Disagree	Agree Don't Know
Q4. Every new patient should have a family history is taken, including 2nd and 3rd-degree relatives such as grandparents, aunts, uncles, and cousins.	Agree	Disagree Don't Know
Q4. Family history taking should be a key component of nursing care.	Agree	Disagree Don't Know
Q4. There is a role for nurses in counseling patients about genetic risks.	Agree	Disagree Don't Know
Q9. Do you think genetic risk (e.g., as indicated by family history) has clinical relevance for breast cancer?	Somewhat A Great Deal	Not at All
Q9. Do you think genetic risk (e.g., as indicated by family history) has clinical relevance for colon cancer?	Somewhat A Great Deal	Not at All
Q9. Do you think genetic risk (e.g., as indicated by family history) has clinical relevance for coronary heart disease?	Somewhat A Great Deal	Not at All
Q9. Do you think genetic risk (e.g., as indicated by family history) has clinical relevance for diabetes?	Somewhat A Great Deal	Not at All
Q9. Do you think genetic risk (e.g., as indicated by family history) has clinical relevance for ovarian cancer?	Somewhat A Great Deal	Not at All
Q11. The extent to which family history supports clinical decisions (such as administering drugs prescribed).	Essential	Not at All Don't Know
Q12. The DNA sequences of two randomly selected healthy individuals of the same sex are 90-95% identical.	False	True Don't Know
Q13. A single gene variant causes the most common diabetes and heart disease.	False	True Don't Know

Aim 3: Evaluate barriers and facilitators of genetics/genomics integration.

Barriers and Facilitators (n=27)

Thirty-seven percent (n=10) responded "Yes" to having genetic content in their nursing curriculum, while 44% (n=12) responded "No," and 18.5% (n=5) responded, "Don't Know." Twenty-two percent (n=6) have attended courses since licensure that included genetic content. However, 55.6% (n=15) reported an intent to learn more about genetics, 15% (n=4) responded "No," and 30% (n=8) selected "Don't Know."

Forty-four percent (n=12) of respondents selected "Don't Know" in response to the ability to attend a genetics course during work hours, 37% (n=10) reported "No," and 19% (n=5) felt they would be able to attend. Alternatively, sixty-seven percent (n=18) said they would attend a course on their own time.

Social Systems (n=27)

Regarding social systems, 48% (n=13) of survey respondents reported that senior staff members do not see genetics as an important **nursing** role. Forty-four percent (n=12) reported "Don't Know," compared to only seven percent (n=2) who reported "Yes." The responses were similar when respondents were asked if they felt that senior staff members viewed genetics as an important part of **their** role. Forty-one percent (n=11) responded "No," forty-eight percent (n=13) reported "Don't Know," and 11% (n=3) reported "Yes."

Statistical Analysis

Scoring of the Genetics and Genomics in Nursing Practice Survey. All survey results were tabulated and analyzed using descriptive statistical techniques. Items from the attitudes, confidence, social system and adoption domains are analyzed individually

and were not combined to form scores. The responses to 12 items (Table 2) measuring genomic knowledge were combined to form a score. Responses to each of the 12 items were first graded as correct or incorrect. A total knowledge score was calculated as the number of correct answers out of 12, with a minimum possible score of 0 and a maximum possible score of 12. Calculation of the total knowledge score was restricted to individuals responding to all 12 items.

Summary

Data analysis revealed that respondents felt inadequately prepared to integrate genetics/genomics into nursing practice; however, half of the respondents indicated an intent to pursue genetic education. Most respondents considered educating nurses on the genetics of common diseases very important. However, a poor genetic knowledge base was a commonly reported theme. Eighty-four percent of respondents answered incorrectly that a single gene variant caused diabetes and heart disease. Moreover, few had heard of or read about the Essential Nursing Competencies and Curricula Guidelines in Genomics. There was a lack of confidence in accessing and providing genetic information for patients, and the adequacy of family history varied. Descriptive analysis revealed that genetics/genomics was not perceived as valuable among staff members, and there was uncertainty if courses could be taken during work hours.

CHAPTER V

DISCUSSION

Relationships of Outcomes to Research

Even though this was a small descriptive study, analysis of the question-specific data revealed early trends. Respondents felt inadequately prepared to integrate genetic/genomics into nursing practice. Knowledge and competency were rated highest as fair or poor dominant. The adequacy of family history varied widely among respondents. Most respondents were uncertain or answered incorrectly regarding single gene variants of common diseases. A significant number felt that genetics/genomics are an essential part of the nursing practice. Respondents also perceived genetics/genomics as critical in counseling patients; however, most had never heard of or read the Essential Nursing Competencies and Curricula Guidelines in Genomics.

In contrast, many respondents indicated an interest in pursuing genetic/genomic education to improve competency. Regarding social context, the descriptive analysis found that respondents overwhelmingly perceived senior staff members did not feel genetics/genomics were an essential part of their role or the role of nursing staff. Rogers (2003) described the influence that social systems have on innovations; hence senior staff can facilitate or hinder the adoption of an innovation.

Observation

Perhaps the most unexpected finding was that 86% of respondents have never heard of or read the Essential Nursing Competencies and Curricula Guidelines in Genomics, which correlates with the 75% of respondents reporting their genetic/genomic knowledge as poor. In addition, respondents felt that the genetics of common diseases were relevant to clinical practice, yet most answered the question regarding the genetics of common diseases incorrectly.

Evaluation of Theoretical Framework

The Ottawa Model of Research Use (OMRU) served as a guide for this quality improvement project. The theory assumes that knowledge translation is an action and is vital in translating research into practice; moreover, for the behavioral change to be effective, barriers and facilitators should tailor knowledge translation strategies in the setting of desired change (Logan & Graham, 1998).

The researchers further explained that health care environments will affect all aspects of the research-to-practice process and should be considered. Studies have shown that education alone is not enough to facilitate the integration of genetics/genomics into nursing practice. Many theories conclude that assessing barriers, facilitators, and tailoring implementation strategies are some of the most critical steps in knowledge translation (Hu et al., 2018).

Limitations

While the survey participants are representative of a convenience sample of registered nurses from VHSO, only two facilities were included in this study which prohibits generalization. The survey delivery was also challenged, as the survey was sent

out three weeks after the expected date due to mandatory union approval. Although the survey was closed after 30 respondents, the final responses were received on closing. The survey was also edited two additional times with key demographics removed, although anonymity would have been protected if left in place. Staff and survey fatigue was viewed as a potential limitation; thus, survey length was considered. Survey participation was also limited to 30 respondents due to the high volumes of government-issued and unsolicited emails that VHSO staff receive. There were several unforeseen barriers to initiating the survey and obtaining data. In the words of the Union President, “You know not many people are going to do the survey.”

Another limitation was that the study focused on registered nurses at only two VHSO locations and specific units. RNs work in various services within the VHSO, and assessing knowledge, competencies, barriers, and facilitators would benefit.

Implications for Future Projects

This quality improvement project aimed to assess barriers and facilitators of genetics/genomics integration into nursing practice and, using this information, formulate an implementation strategy to enhance nursing knowledge in this area at VHSO. This was accomplished by assessing nurses' attitudes, receptiveness, knowledge, competency, social systems, and confidence in adopting genetics/genomics. This project provides some preliminary indications of attributes that contribute to the adoption of genetics and genomics. Few nurses felt prepared to integrate genetics/genomics or perceived themselves as having knowledge, competency, or confidence. Respondents did not feel genetics and genomics were essential within their primary social system.

Alternatively, respondents did perceive the relevance of genetic/genomic innovations as an advantage and compatible with their existing values and nursing practice. Therefore, continual assessments of barriers and facilitators of genetic/genomic integration and creating knowledge translation strategies are critical. One recommendation is to consider a national study of all registered nurses employed by the Department of Veterans Affairs or those throughout the VHSO.

Although genetic and genomic innovations have increasingly emerged since the completion of the HGP, there is a lack of integration into the nursing practice, and the reasons are multi-faceted. A large study may provide greater insight into the preparedness for integrating genetics and genomics into nursing practice. Further studies to explore this phenomenon are also recommended.

Implications for Future Practice

This study provided insights into baseline genetic and genomic knowledge levels and potential barriers and facilitators to that knowledge. The data revealed poor knowledge scores and confidence in integrating genetics and genomics. These results correlated with the lack of awareness and understanding of the *Essential Nursing Competencies and Curricula Guidelines in Genomics.* The importance of genetics and genomics continues to be lamented in literature; however, a foundation is necessary before one can build. One implication for practice is to create a mandatory training module on the *Essentials*; completion would be required by all registered nurses regardless of education and role.

Resource allocation and strategies to increase genomic competency are vital to nursing, as innovations breach specialty-specific practices. Nurses are expected to

possess basic genetic and genomic knowledge. Creating continuing education courses on genetics and genomics would help facilitate expertise and bridge the research-to-practice gap. Numerous initiatives have promoted genetics and genomics in nursing practice, including online resources for nurses and educators. Introducing only a few of these evidence-based tools is also a way to encourage the adoption of genetics and genomics into nursing practice.

Conclusion

This quality improvement project assessed barriers and facilitators of genetics/genomics integration into nursing practice. The study evaluated registered nurses' knowledge and competencies in genetics and genomics. Data analysis revealed that nurses lacked the competencies and confidence to integrate genetics and genomics into nursing practice. However, there was an indication that genetics/genomics was considered necessary to the nursing practice; a high response rate indicated a willingness to increase knowledge. Unfortunately, respondents also felt that genetics and genomics were not essential in their primary social systems. These findings can be used to justify resource allocation toward an intervention that increases genomic nursing competency. Continual assessments of the nursing workforce for genomic competency are essential. This study complements a growing body of knowledge and could be used as the foundation for future projects.

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APPENDIX

Appendix A

Non-Human Subjects/ Non-Research Decision

DEPARTMENT OF VETERANS AFFAIRS
Medical Center
1100 North College Avenue
Fayetteville, AR 72703-6995

DATE: January 11, 2022

Title: *[1669264-1] Genetics and Genomics in Nursing Practice: Assessing Barriers, Facilitators and Tailoring an Implementation Strategy for Veterans Health Care System of the Ozarks*

PRINCIPAL INVESTIGATOR: JaAnna Guillory

Your proposal as listed above has been reviewed and discussed in the R&D meeting on January 11, 2022. This project has been reviewed by both the VHSO IRB subcommittee and VHSO R&D Committee and it was determined that this project does NOT meet the Common Rule or FDA definition of research. Due to the determination of non-research, oversight of this project is no longer required of the VHSO Research and Development Committee or associated subcommittees.

We wish you well as you work through this non-research project.

Gretchen Gibson

Gretchen Gibson, DDS, MPH
Research Coordinator
479-305-7299

Appendix B

Genetics and Genomics Nursing Practice Survey

You are invited to take a survey that will evaluate primary issues in genetics and genomics. As the front line of care, nurses have a central role in seeing that genetic and genomic discoveries lead to disease prevention and population health improvements. We will evaluate a general assessment of your knowledge. Knowing your baseline knowledge will help you determine your learning needs.

Before choosing to participate, please consider that:

• You have been invited to complete this survey because you are a registered nurse. Questions in the survey relate to your current practices, knowledge, and opinions about the implications of genetic and genomic medicine for preventing and treating common diseases such as cancer, diabetes, and heart disease.

• The survey will take about 10-15 minutes to complete.

• Your participation in this survey is completely voluntary and you can choose to skip any questions that you do not wish to answer.

• There are no risks, penalties, or costs to your participation. There are no direct benefits to your participation other than contributing to research.

• Many of the questions relate to your attitudes about genetics and genomics for which there are no right or wrong answers.

• All information you provide is anonymous.

If you have any questions about the survey, please contact Jai Guillory @ jaiguillory@gmail.com or (417) 592-4538.

PART I

1. How important do you think it is for the nurse to become more educated about the genetics of common diseases?

- [ ] Extremely important
- [ ] Very important
- [ ] Somewhat important
- [ ] Not at all important

2. Please indicate whether you think each of the following would be a potential advantage or disadvantage of integrating genetics of common diseases into your practice.

	Advantage	Disadvantage	Neutral
Better treatment decisions (e.g., which drugs to prescribe)	○	○	○
Improved services to patients	○	○	○
Would increase insurance discrimination	○	○	○
Increased adherence among patients	○	○	○
Would take too much time	○	○	○
Too costly	○	○	○
Need to "re-tool" professionally	○	○	○
Increase patient anxiety about risk	○	○	○

PART II

3. Each of the following statements relates to the genetics of common diseases and family history taking. Common diseases refer to disorders that arise from interactions between an individual's environment and their unique genetic makeup, such as cancer, heart disease, and diabetes. Please indicate how confident you are that you can do each of the following:

	Not at all confident	Confident
Decide what family history information is needed to identify a patient's genetic susceptibility to common diseases.	○	○
Discuss how family history affects recommended screening intervals.	○	○
Decide which patients would benefit from a referral for genetic counseling and possible testing for susceptibility to common diseases.	○	○
Access reliable and current information about genetics and common diseases.	○	○
Give patients information about the risks, benefits, and limitations of genetic testing for common diseases.	○	○

4. Please indicate whether you agree or disagree with the following statements.

	Agree	Disagree	Don't know
A family history that includes only 1st degree relatives such as parents, siblings, and children should be taken for every new patient.	◯	◯	◯
A family history that includes 2nd and 3rd degree relatives such as grandparents, aunts, uncles, and cousins should be taken for every new patient.	◯	◯	◯
Family history taking should be a key component of nursing care.	◯	◯	◯
There is a role for nurses in counseling patients about genetic risks.	◯	◯	◯

PART III

5. Are you actively taking care of patients?

- [ ] Yes
- [ ] No (If **NO** skip to **PART FOUR**)

6. In the past three months, how often have you collected a complete family history from a patient that includes the following components: information on disorders from three generations, age at diagnosis, and death for each affected family member?

- [ ] Always
- [ ] Often
- [ ] Occasionally
- [ ] Rarely or Never

7. In the past three months, has any patient initiated a discussion with you about genetics?

- [ ] Yes
- [ ] No

8. Thinking specifically about patients that you have seen in the **past three months**, please answer the following questions.

	Never	Rarely	Occasionally	Frequently	
How often have you used family history information when facilitating clinical decisions or recommendations for your patients?	○	○	○	○	○
How often have you facilitated referrals to genetic services?	○	○	○	○	○

PART IV

4. Please indicate whether you agree or disagree with the following statements.

	Agree	Disagree	Don't know
A family history that includes only 1st degree relatives such as parents, siblings, and children should be taken for every new patient.	○	○	○
A family history that includes 2nd and 3rd degree relatives such as grandparents, aunts, uncles, and cousins should be taken for every new patient.	○	○	○
Family history taking should be a key component of nursing care.	○	○	○
There is a role for nurses in counseling patients about genetic risks.	○	○	○

PART V

The first group of questions is about human genetic variation. Please check the answer that indicates whether the statement is true, false or you do not know.

12. The DNA sequences of two randomly selected healthy individuals of the same sex are 90-95% identical.

- ☐ True
- ☐ False
- ☐ Don't know

13. Most common diseases such as diabetes and heart disease are caused by a single gene variant.

- ☐ True
- ☐ False
- ☐ Don't know

PART VI

14. The Essential Competencies and Curricula Guidelines for Nurses in Genetics and Genomics are endorsed as being a standard part of nursing practice. Have you heard or read about these Competencies?

- ☐ Yes
- ☐ No

15. Please rate your understanding of the genetics of common diseases.

- ◯ Excellent
- ◯ Good
- ◯ Poor

16. In describing your genetic/genomic knowledge, what would you consider it to be?

- ◯ Excellent
- ◯ Good
- ◯ Poor

PART VII

Learning more about genetics and its application to your professional practice:

17. Please answer the following about genetics and your professional practice:

	Yes	No	Don't know
Did your nursing curriculum include genetics content?	◯	◯	◯
Since licensure, have you attended any courses that included genetics as a major component?	◯	◯	◯
Do you intend to learn more about genetics?	◯	◯	◯
Would you be able to attend a course during work hours?	◯	◯	◯
Would you attend a course on your own time?	◯	◯	◯
Do you think your senior staff members see genetics as an important part of **your** role?	◯	◯	◯
Do you think your senior staff members see genetics as an important part of **their** role?	◯	◯	◯

PART VIII

18. Are you a member of the American Nurses Association?

- ☐ Yes
- ☐ No

19. Are you currently a student?

- ☐ Yes
- ☐ No

20. Total number of years you have worked in Nursing:

21. Your current **primary** functional area: **(Mark ONLY ONE)**

- ☐ Administration
- ☐ Education
- ☐ Research
- ☐ Patient care
- ☐ Student
- ☐ Other (please specify)

22. What percent of your work-time is spent taking care of patients? (%)

23. What is your current **primary** area of practice or expertise?

- [ ] Staff Nurse
- [ ] Head Nurse
- [ ] Nurse Practitioner
- [ ] Clinical Nurse Specialist
- [ ] Educator
- [ ] Supervisor
- [ ] Researcher
- [ ] Director/Assistant Director
- [ ] Consultant
- [ ] Case Manager
- [ ] Other (please specify)

24. What is the highest **nursing degree** that you have you received?

- [ ] None
- [ ] Licensed Practical/Vocational Nurse
- [ ] Diploma
- [ ] Associate Degree in nursing
- [ ] Baccalaureate Degree in nursing
- [ ] Master's Degree in nursing
- [ ] Doctorate Degree in nursing

Thank you for taking the time to complete this survey.
Your participation is greatly appreciated!

Appendix C

Total Knowledge Score Items with Correct Response Options

Q4. A family history that includes **only** the 1st-degree relatives such as parents, siblings, and children should be taken on every new patient. **Disagree**

Q4. Every new patient should have a family history taken, including 2nd and 3rd-degree relatives such as grandparents, aunts, uncles, and cousins. **Agree**

Q4. Family history taking should be a key component of nursing care. **Agree**

Q4. There is a role for nurses in counseling patients about genetic risks. **Agree**

Q9. Do you think genetic risk (e.g., as indicated by family history) has clinical relevance for breast cancer? **Somewhat or A Great Deal**

Q9. Do you think genetic risk (e.g., as indicated by family history) has clinical relevance for colon cancer? **Somewhat or A Great Deal**

Q9. Do you think genetic risk (e.g., as indicated by family history) has clinical relevance for coronary heart disease? **Somewhat or A Great Deal**

Q9. Do you think genetic risk (e.g., as indicated by family history) has clinical relevance for diabetes? **Somewhat or A Great Deal**

Q9. Do you think genetic risk (e.g., as indicated by family history) has clinical relevance for ovarian cancer? **Somewhat or A Great Deal**

Q11. The extent to which family history supports clinical decisions (such as administering drugs prescribed). **Essential**

Q12. The DNA sequences of two randomly selected healthy individuals of the same sex are 90-95% identical. **False**

Q13. A single gene variant causes the most common diabetes and heart disease. **False**