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Educating Primary Care Providers on Use of Pharmacogenetic Testing in Pain Management

Providence Sey
Walden University

Walden University

College of Nursing

This is to certify that the doctoral study by

Providence Sey

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Lilo Fink, Committee Chairperson, Nursing Faculty
Dr. Patricia Schweickert, Committee Member, Nursing Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2024

Abstract

Educating Primary Care Providers on Use of Pharmacogenetic Testing in Pain Management

by

Providence Sey

MSN, Chamberlain University, 2019

BSN, George Mason University, 2005

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

February 2024

Abstract

Chronic pain is a serious and widespread problem. In 2021, 20% of U.S. adults experienced chronic pain, which severely affected 7%. The practice problem identified for this project was the need for enhanced chronic pain management in primary care, a significant concern given its prevalence and its impact on patients' lives. The purpose of this project was to determine if an educational intervention on pharmacogenetic (PGx) testing could elevate primary care providers' (PCPs) knowledge, thereby improving pain management. The ADDIE model served as the conceptual framework for developing the educational content. Guided by practice-focused questions, it was determined whether educating clinicians on PGx testing would increase their knowledge, as measured by pre- and post-surveys, and if literature would support such an educational initiative for treating chronic pain in primary care settings. The methodology involved a pretest-posttest design, engaging 12 participants of mainly PCPs. The data were analyzed using SPSS software, employing descriptive statistics to compare knowledge levels before and after the intervention. Results showed a 21.20% average improvement in posttest scores, affirming that education significantly boosted clinician understanding of PGx testing. This response to the practice-focused questions highlights the intervention's success. The project substantiates that educational programs on PGx testing can enhance knowledge, potentially leading to more individualized and effective pain management. Implications for social change include improved patient care in chronic pain management, benefiting healthcare professionals through better knowledge and chronic pain sufferers through optimized treatment strategies.

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Section 1: Nature of the Project

Introduction

The problem that I identified in this Doctor of Nursing Practice (DNP) project was chronic pain and the lack of appropriate management of pain with opioids prescribed without pharmacogenetics testing (PGx; Haga et al., 2021). Despite evidence supporting the benefits of PGx testing in individuals dealing with long-standing pain, use of PGx testing remained low in the outpatient clinical care setting (Kusic et al., 2022). The significance of this problem was twofold: first, it contributed to the opioid epidemic that was affecting the United States (Substance Abuse and Addiction Statistics) (NCDAS), 2022). In 2020, it was estimated that 3.4% of adults, or around 9.5 million people, had abused opioids (Frieden, 2021). Additionally, 9.3 million people were estimated to have abused prescription medications in the past year, with 1.2 million new prescription painkiller users expected to have emerged in 2020 (Frieden, 2021). Second, it led to a trial-and-error approach to prescribing, which could be costly, time-consuming, and less effective (Kusic et al., 2022).

The gap in practice that I addressed was the need for more understanding and use of pharmacogenetics testing among providers and clinicians in outpatient and primary care settings. With a deeper understanding of pharmacogenetics, there was more evidence for its clinical benefits, limited resources, and inaccessibility of the tests (His House, 2021). However, pharmacogenetics had the potential to improve individualized treatment and bring economic and therapeutic benefits, as seen in several wealthy nations (Albassam et al., 2018). Additionally, primary care providers (PCPs) needed more

knowledge, awareness, and confidence to use pharmacogenetics testing. I addressed this knowledge gap and support the implementation of PGx testing in outpatient and primary care settings (Albassam et al., 2018).

The problem I identified in this DNP project was the lack of appropriate management of pain with opioids prescribed without pharmacogenetics testing, which contributed to the opioid epidemic and led to a trial-and-error approach to prescribing (see Lasky, 2020). The literature gap I addressed was the lack of understanding and utilization of pharmacogenetics testing among providers and clinicians in outpatient and primary care settings and the lack of knowledge, awareness, and confidence among primary care providers to utilize pharmacogenetics testing (see Yamamoto et al., 2019).

The gap I identified in this DNP project was a need for more understanding of PGx testing and its utility in primary care settings (see Kusic et al., 2022). The primary care practitioner's lack of access to PGx testing may have been attributable to a lack of information or comprehension about PGx testing: Some of these patients had been dealing with chronic pain for years, and it was easier to switch them to a different medicine if one was not effective (Lasky, 2020). Evidence supported using PGx testing to identify medication-related issues in treating chronic pain in the primary healthcare setting (Magarbeh et al., 2021). Implementing an educational presentation on PGx testing could enhance chronic pain management in the target patient population through tailored drug management. In primary care, genetic testing was a reference for prescribing medications for chronic pain management. This technique needs to be used in primary care settings (Deodhar et al., 2021).

Problem Statement

The problem I identified in this DNP project was the need for enhanced chronic pain management and a gap of lack of understanding of pharmacogenetics (PGx) testing in Northern Virginia suburbs and the value of testing in a primary care setting (Kusic et al., 2022). The preceptor stated that,

> Most of our patients had chronic pain, and they cared about taking their medications and would let you know when the medications were no longer working; it was easier for them that way. And I brought them in twice a year to monitor the urine drug screen and monitored them on the Prescription Drug Monitoring Programs (PDMP).

Evidence in the literature supported the benefit of using PGx testing to identify medication-related problems (Deodhar et al., 2021) regarding chronic pain treatment in the primary healthcare setting (Hange et al., 2022)

The primary care practitioner's (PCP) lack of access to pharmacogenetic (PGx) testing may have been attributable to a gap in knowledge of or comprehension of PGx testing, with an indication that some of these patients had been dealing with chronic pain for years. Moving them to a different medicine was easier if one was ineffective (Lasky, 2020). Literature supported using PGx testing to identify medication-related issues in treating chronic pain in the primary healthcare setting (Magarbeh et al., 2021). Implementing an educational presentation on PGx testing could have enhanced chronic pain management in the target patient population through tailored drug management. In primary care, genetic testing was a reference for prescribing medications for chronic pain

management and depression. Nonetheless, this technique was underutilized in primary care settings (Deodhar et al., 2021).

The problem of the lack of PGx testing in the outpatient clinical care setting was a significant issue identified in the literature (Kusic et al., 2022). Using PGx testing to manage chronic pain could significantly benefit individuals dealing with long-standing pain, allowing for more personalized and effective treatment options. However, despite the potential benefits of PGx testing, many PCPs lacked the knowledge and understanding necessary to effectively implement it in their practice. The lack of information and understanding of PGx testing among healthcare providers could lead to a one-size-fits-all approach to medicine rather than an individualized approach. This could result in the over-prescription of medication, leading to adverse reactions and the potential for addiction and overdose. In 2020, it was estimated that 3.4% of adults, or around 9.5 million people, had abused opioids. In the past year, 9.3 million people had abused prescription medications (Frieden, 2021). In 2020, there were 1.2 million new prescription painkiller users (Frieden, 2021).

My goal for this project was to educate providers on pharmacogenetics testing (PGx) in chronic pain treatment, thereby reducing trial and error in prescribing. Increasing the understanding and acceptance of PGx testing among healthcare providers could lead to more effective treatment outcomes for patients with chronic pain and reduce the risk of addiction and overdose. I addressed the lack of PGx testing use by outpatient providers and clinicians by providing an educational program that would aid in administering and managing individuals taking prescription opioid medications. The

majority of patients in a study of patients with chronic pain and opioid use disorder were receptive to pharmacogenetic testing and believed that genetic testing had the potential to improve their medical care (Kusic et al., 2022). Opioid analgesics were widely given for treating acute and chronic pain, but individual variances in opioid responsiveness made successful pain management in all patients an elusive objective (Nerenz & Tsongalis, 2018).

Pharmacogenomics (PGx) emerged as a promising technique in managing chronic pain, as it allowed for more individualized treatment options, reducing the risk of adverse reactions and addiction (Albassam et al., 2018). Despite the fact that PGx testing could guide and support appropriate treatment decisions for some patients, many PCPs saw more drawbacks than advantages due to a lack of information. Prior studies had demonstrated medical practitioners' challenges with PGx testing. These hurdles were a lack of medical personnel comprehension, awareness, and confidence (Albassam et al., 2018). Understanding healthcare providers' pharmacogenetic knowledge, attitudes, and self-assurance was essential for test acceptance and utilization (Albassam et al., 2018). In the United States, over 70,000 drug overdose deaths occur annually (NCDAS, 2022). Pharmacogenetics reduced the adverse medication reactions (His House, 2021).

Educating PCPs about PGx evidence-based testing allowed them to accurately determine the proper medication for their patients based on DNA findings from a simple PGx test (Haga et al., 2021). Currently, PCPs often avoided using PGx testing when prescribing pain medication because patients requested new medications if one was ineffective, making it easier for them (Albassam et al., 2018). The principle behind PGx

testing was that personalized pain management could be achieved by prescribing medications that were genetically compatible with the patient's genetic profile, reducing the risk of drug overdose (Haga et al., 2021). The goal of PGx testing was to aid PCPs in prescribing effective pain medication, recognizing that more medication was not always the best solution and put the patient at risk of adverse events (Haga et al., 2021).

Methamphetamine and fentanyl are the deadliest narcotics in Virginia. In the Western and Central United States, West Virginia had the most overdose deaths with 51.5 per 100,000 (National Center for Drug Abuse Statistics, 2019). This highlighted the need for more effective treatment options to combat the opioid epidemic and address the issue of chronic pain management. In 2020, the federal government allocated $34.6 billion for drug control efforts, prevention, treatment, interdiction, and law enforcement. $1.2 billion was dedicated to the fight against opioid dependency (NCDAS, 2022). The Department of Education received $55.5 million for school substance abuse prevention and technical support. Substance Abuse and Mental Health Services Administration (SAMSHA) provided $1,500,000,000 to tribes, states, and territories to combat the opioid epidemic (NCDAS, 2022). The underuse of pharmacogenetics (PGx) testing in Northern Virginia's primary care setting for chronic pain management, despite its potential to offer personalized treatment and address the region's significant opioid abuse issue is hindered by primary care practitioners' lack of knowledge and confidence in its implementation (Albassam et al., 2018; Deodhar et al., 2021; Frieden, 2021; Hange et al., 2022; His House, 2021; Kusic et al., 2022; Lasky, 2020; NCDAS, 2022; NCDAS, 2019).

Purpose Statement

The purpose of this DNP project was to educate PCPs about the gap in practice and address the problem of the lack of PGx testing utilization in the outpatient clinical care setting. I educated primary care providers on the benefits and implementation of PGx testing in chronic pain treatment, which is a tool that aids in prescribing decisions based on a patient's genetic profile. In this clinical setting, PCPs were not using PGx testing when prescribing pain medication for chronic pain patients during their clinic visits. This practice problem had led to a gap in practice between recommendations for PGx testing and the PCPs' practice protocols at the clinic. The educational program was designed to provide PCPs with a deeper understanding of PGx testing and its appropriate use in treatment decisions, with the goal of increasing the acceptance and utilization of PGx testing among PCPs. I provided an additional tool for the safe and effective medication treatment of patients with chronic pain.

Practice Focused-Questions

I addressed the need for more understanding and use of PGx testing among providers and clinicians in outpatient and primary care settings (see Nerenz & Tsongalis, 2018). The DNP practice-focused questions that guided this evidence-based educational project on PGx testing were:

- Will educating clinicians on PGx testing increase their knowledge as evidenced by pre/post survey?
- Will the literature support an education project on PGx testing in chronic pain treatment in a primary care clinic?

The desired outcome of the project was to increase the knowledge base regarding PGx testing and the value of PGx results among a group of primary care practitioners in Northern Virginia suburbs.

Nature of the Doctoral Project

My goal for this project was to educate practitioners on the benefits of PGx testing. For patients who suffered from chronic pain, PGx testing offers practitioners evidence-based drug choices through an effective pharmaceutical treatment that was individualized to a person's DNA and metabolic profile (Yamamoto et al., 2019). Through Walden University's education process, the institution encouraged students to create positive change to better people's lives (Walden University, 2020). This DNP project addressed the lack of understanding and use of PGx testing for chronic pain therapy in primary care. PGx testing provided for more tailored and better treatment for long-term pain sufferers.

Despite the potential benefits of PGx testing, many PCPs needed more knowledge and understanding to apply it in their practice effectively. This project was an evidence-based educational program to teach practitioners about the application and benefits of PGx testing. I thoroughly reviewed the literature and gathered evidence from peer-reviewed publications, government reports, and expert opinions. Genetic variants and opioid pharmacokinetics and pharmacodynamics were covered in the literature review. I acquired sources from various databases and scholarly articles published within the past 5 years. I assessed the shift in practitioners' understanding of PGx testing before and after the educational program.

Sources of Evidence

I focused on educating practitioners on the use and benefits of PGx testing. I addressed the following questions:

1. What literature supported the use of PGx testing in the treatment of chronic pain in the primary care setting?
2. Was there a shift in the practitioners' understanding of PGx testing, as demonstrated by pre- and posttest results?

I conducted a thorough review of the literature and gathering evidence from a variety of sources. This evidence-based educational project was geared toward teaching practitioners about the application and benefits of PGx testing (see Nerenz & Tsongalis, 2018).

I gathered sources of evidence from the Walden Library, including Cumulative Index to Nursing & Allied Health Literature (CINAHL), MEDLINE, academic journals, peer-reviewed scholarly articles, and PGx testing laboratories. All information was within the last 5 years to ensure the validity of the information provided in this DNP educational project. I created a literature review matrix to highlight the information in the articles (Appendix A).

Approach

The ADDIE model is an evidence-based educational project widely used by instructional designers and training producers. It involved five processes, namely Analysis, Design, Development, Implementation, and Evaluation. According to Culatta (2021), the ADDIE model is a general technique used to produce successful training and

performance support solutions. The Analysis phase involves identifying the goals, learners, and performance gaps, while the Design phase focuses on developing the learning objectives, strategies, and assessment methods. The Development phase entails creating and producing the learning materials, while the Implementation phase involves delivering the training to the learners. Finally, the Evaluation phase involves assessing the effectiveness of the training program in meeting the identified goals and performance gaps (Culatta, 2021).

The Walden University's Staff Education Manual's planning, implementing, and assessing procedures guided the project in all its phases. According to Walden University (2019), the manual provided a systematic approach for developing, implementing, and evaluating training programs. It involved identifying the learning needs, developing the learning objectives, designing the instructional strategies, and assessing the learning outcomes. Furthermore, the manual provided guidelines for selecting appropriate learning resources, delivering the training, and evaluating its effectiveness. In summary, the ADDIE model and Walden University's Staff Education Manual's planning, implementing, and assessing procedures provided a robust framework for developing evidence-based educational projects. These approaches ensured that the training programs were aligned with the identified goals and performance gaps and were effective in meeting the learners' needs. As such, instructional designers and training producers could use these models to produce successful training and performance support solutions that met the evolving needs of the learners and organizations.

Planning

I used the ADDIE paradigm to create a comprehensive literature review and create an instructional program to understand PGx testing (see Culatta, 2021). I worked with the preceptor, an internist and a rheumatologist to develop the education project. Next, I developed a PowerPoint presentation on PGx testing and obtained a synchronous pretest/posttest through SurveyMonkey regarding PGx testing to present to the practitioners. After the Institutional Review Board (IRB) - (IRB #: 11-16-23-1017266) reviewed the project and gave its clearance, I implemented this project on PGx testing in the outpatient clinic.

Implementation

After the completion of the project, I assessed the pre- and posttest knowledge of the primary care practitioners who participated in the PGx testing educational project and presented the facilitator's findings. The practitioner's grasp of PGx testing and desire to employ it was determined through SurveyMonkey tests (SurveyMonkey, 2022). I used the data to document the PGx educational project's findings and facilitator's conclusions for the report. The SurveyMonkey test was used to assess the practitioner's familiarity with PGx testing and desire to use it (SurveyMonkey, 2022).

Evaluation

The final step involved the evaluation phase of the educational project, evaluating the participants through the change in understanding from the pretest answers to the posttest responses on their objectives. I assessed the participants based on the degree to which their comprehension of the goals changed from their pretest responses to their

posttest responses. I used inductive statistics to analyze the test results and appreciated the benefits of the project's pharmacogenetic testing to treat chronic pain patients effectively (see Kusic et al., 2022). The final step of the doctoral educational-based project's process was the evaluation of the findings and the presentation of the publication results via Walden University (Walden University, 2019).

Significance

I addressed a critical issue in healthcare: the lack of understanding and use of PGx in the primary care setting for the treatment of chronic pain, as demonstrated by Magarbeh et al. (2021) and Kusic et al. (2022), who found that PGx testing was essential for implementing pharmacogenetics knowledge in daily clinical practice to optimize pharmacotherapy of individual patients. However, many PCPs needed more knowledge and understanding to implement it in their practice effectively.

The significance of this project was that educating primary care providers on the benefits and implementation of PGx testing in chronic pain treatment improved individualized treatment options and reduced the risk of addiction and overdose, as demonstrated by Kusic et al. (2022), who found that 55% and 66% of patients desired pharmacogenetic testing. Additionally, by providing PCPs with the knowledge and tools to effectively manage patients with chronic pain and opioid use disorder, this project could reduce of opioid addiction and overdose, as presented by Frieden (2021), who found that 3.4% of adults, or around 9.5 million people, had abused opioids in 2020 and that 1.2 million new prescription painkiller users had been added in the same year. PCPs were provided with the necessary skills to avoid making their patients prone to drug

addictions and assist patients with pharmacogenetic testing prior to treatment, and this project could result in the reduction of adverse medication reactions, as reported by His House (2021), which stated that adverse medication reactions killed 770,000 Americans annually.

Summary

In this project, I educated PCPs in the Northern Virginia suburbs about the PGx testing tool in chronic pain management. I focused on the practitioner's comprehension of the advantages of adopting PGx testing as a tailored method to manage chronic pain patients. The genotype-based treatment offered a personalized approach to pain management and reduced the trial-and-error method of treating chronic pain sufferers (Haga et al., 2021). I addressed the problem of lack of understanding and utilization of pharmacogenetics in the primary care setting to treat chronic pain (Haga et al., 2021). The project was an evidence-based educational program in which I taught practitioners about the application and benefits of PGx testing. My goal was to improve individualized treatment options, reduce the risk of adverse reactions, and assist in managing patients with chronic pain and opioid use disorder.

In Section 2, I will address the outcome of the educational project, teaching PCPs why one medicine was superior to another in achieving the ultimate objective of appropriate pain control. In the context of chronic pain management, the selection of appropriate medications is crucial to achieving successful pain control while minimizing adverse drug reactions. One key factor that influences the efficacy and safety of medications is an individual's metabolic enzymes and genetic polymorphisms. By

educating PCPs about these factors and their crucial role in medication metabolism, I helped them select drugs that were more likely to be effective and safe for their patients. Educating PCPs about the importance of metabolic enzymes, genetic polymorphisms, and enzymes' crucial role in medication metabolism helped select drugs that could successfully treat chronic pain and minimize adverse drug reactions.

Section 2: Background and Context

Introduction

The DNP practice-focused questions that I used to guide this evidence-based educational project on PGx testing were:

- Will educating PCPs on PGx testing increase their knowledge as evidenced by pre/post survey?
- Will the literature support an education project on PGx testing in chronic pain treatment in a primary care clinic?

In my literature review, I addressed the need for more understanding and utilization of PGx testing among a group of primary care/pain management practitioners in Northern Virginia suburbs. This evidence-based educational DNP project on PGx testing in pain management occurred at an outpatient primary care/pain management clinic in a Northern Virginia suburb. The participants in this DNP educational project included primary care/pain management practitioners from the clinic that treated patients with chronic pain in this DNP educational project. I conducted the project to educate providers on PGx testing in chronic pain treatment, reducing trial and error in prescribing. I used a PowerPoint training presentation for the practitioners involved in providing treatment and increasing the use of PGx testing in clinical practice.

PGx testing could be used in identifying primary care patients at elevated risk for medication toxicity, poor response, or treatment failure and guide drug management. Despite the increasing availability of PGx testing, physicians needed to be equipped to

use it frequently for clinical decision-making. Primary care PGx testing required practice-based resources to overcome implementation obstacles (Weitzel et al., 2019).

Concepts, Models, and Theories

Concept

Following the completion of the Human Genome Project several decades ago, numerous genomics applications emerged in a variety of fields, including health, illness, and medicine (National Human Genome Research Institute (NHGRI), 2023). This was partly facilitated by the U.S. government's ability to deploy a novel program to reduce the cost of sequencing an entire human genome to a level that was no longer prohibitively expensive (Ampong, 2019). Sixty to 70% of patients resisted pharmaceutical treatment; pharmacogenetic testing enhanced treatment outcomes by individualizing medication therapy based on a patient's metabolism (NHGRI, 2023). Before a patient's treatment, PGx testing was crucial for adjusting the dosage of psychiatric medications and preventing injury (Ampong, 2019).

Model

For this project, I used the ADDIE model, a general technique used by instructional designers and training producers (see Culatta, 2021). The ADDIE model had five processes for producing successful training and performance support solutions which included: Analysis, design, development, implementation, and evaluation. Application of the ADDIE model was expected in nursing professional development, with examples found throughout the literature demonstrating successful education program completion

(Culatta, 2021). The project followed Walden University's Staff Education Manual's planning, implementing, and assessing procedures (Walden University, 2019).

Theory

In 1977, Albert Bandura developed his social-cognitive and self-efficacy theories, suggesting that self-efficacy and result expectancies were essential for initiating and maintaining activity (Bandura, 1977). While self-efficacy was considered particularly important for goal planning, execution, and achievement, it was also an effective therapeutic target (Bandura, 1977). his theory of self-efficacy described in greater depth the factors that influenced self-efficacy expectations. According to Albert Bandura, self-efficacy theory was the cornerstone of human inspiration, motivation, performance, achievements, and emotional well-being. Changing one's actions could transform an individual's motivation, cognitive capacities, affect, and decisions; as practitioners, they could evoke change with the force of medical advancements and the belief that change was possible for the benefit of the patients they treated (Bandura, 1977).. Managing chronic pain is complex in primary care (Lippke, 2020). Managing chronic pain requires improving a person's daily functioning by decreasing pain and depressive symptoms.

Analysis

I conducted analysis to evaluate the impact of PGx testing information presented to a specific group, the educational platform used, and the preferred learning method in the adult medical profession. I identified the problem of managing chronic pain patients in a clinical setting and sought to improve outcomes by incorporating personalized medicine through PGx testing. Recent studies demonstrated the importance of

personalized medicine in managing chronic pain, highlighting the need for effective educational strategies to support the integration of PGx testing in clinical practice. For instance, Shah et al. (2021) reported that utilizing an online educational platform improved healthcare provider's knowledge and confidence in integrating PGx testing into their practice. Therefore, effective educational strategies, tailored to the learning needs of healthcare providers, were essential in facilitating the adoption of PGx testing in clinical practice.

Design/Development

The purpose of this educational project was to enhance primary care providers' knowledge of the benefits of PGx testing in individualized patient prescribing practices. In order to ensure the validity of the information provided, I conducted a literature review using databases such as PubMed, CINAHL, and Cochrane Library. Relevant articles from the past 5 years were included in the review. After gathering scholarly articles on PGx testing, I developed an educational PowerPoint presentation and created PGx testing product result samples to disseminate to interested providers. I consulted with content experts to ensure the accuracy and relevance of the educational materials. I developed pretest and posttest surveys to assess the effectiveness of the educational intervention, and interested providers were contacted via email to participate in the project. My goal for this project was to increase providers' understanding of how PGx testing can lead to improved patient satisfaction, reduced medication waste, decreased financial burden from failed medication trials, and positive changes in opioid prescribing practices.

Recent studies have shown that PGx testing can significantly impact patient outcomes and reduce healthcare costs. For example, Li et al. (2021) found that patients who received PGx-guided medication therapy had a significantly lower hospitalization rate than those who received standard care. Kauffman et al. (2020) demonstrated that PGx testing was associated with a significant reduction in overall medication costs.

The purpose of my project was to empower primary care providers with knowledge of the benefits of PGx testing, ultimately leading to better patient outcomes and reduced healthcare costs. By disseminating current and relevant information on PGx testing, my goal was to promote positive changes in prescribing practices and improve patient care.

Relevance to Nursing Practice

Pharmacogenetic (PGx) testing is an emerging tool for optimizing pain management and treatment (Yamamoto et al., 2019). Educating PCPs on the value of PGx testing gave them the knowledge and skills necessary to make informed decisions when choosing medications for their patients. Practitioners can use this knowledge to confidently prescribe medications compatible with an individual's cellular composition, thereby improving the effectiveness of treatment and patient outcomes (Lippke, 2020). Through education, practitioners better understood how PGx testing could be used to improve pain management and chronic pain treatment. This knowledge can enhance self-efficacy among practitioners who have the necessary tools to make informed decisions when treating patients (Kusic et al., 2022).

There were numerous benefits of using PGx testing as an integrated tool for treating chronic pain. It could positively impact the patient population by providing individualized treatment plans tailored to each patient's unique DNA profile (Yamamoto et al., 2019). Although PGx testing is a relatively new process to the medical profession, it is an increasingly important tool for optimizing pain control and chronic pain management (Yamamoto et al., 2019). Educating practitioners on the benefits of PGx testing could improve their confidence levels in prescribing medications that were compatible with an individual's cellular composition, resulting in improved patient outcomes. By leveraging the power of knowledge and education, healthcare providers could provide their patients with more effective pain management treatment options (Kusic et al., 2022).

Local Background and Context

Chronic pain management in rural Northern Virginia is often hindered by limited access to treatment centers. This is a significant issue because it affects the quality of life of patients who suffer from chronic pain. I developed an educational presentation on the benefits of PGx testing for practitioners to address this issue. In the presentation, I focused on the patient's individual DNA and metabolic profile, which could be used to personalize treatment options and improve the efficacy of pain management. PGx testing could also potentially reduce adverse drug events, including accidental opioid overdose. Studies showed that PGx testing could improve treatment efficacy in patients with chronic pain. For example, Smith et al. (2019) found that PGx-guided prescribing

significantly decreased pain intensity and improved physical function among patients with chronic musculoskeletal pain.

Katz et al. (2019) found that PGx-guided opioid therapy reduced opioid use by 50% in chronic non-cancer pain patients while maintaining pain relief. (During the educational presentation, a local representative from a genomic laboratory discussed the testing process and their role in the testing process. This helped practitioners understand the benefits and potential drawbacks of PGx testing, and how to integrate this testing into their practice to improve patient outcomes. As a DNP student, I presented the benefits and improved safety of the PGx testing process for chronic pain patients. to the purpose of this educational intervention was to increase awareness of PGx testing among practitioners and improve pain management outcomes for patients in rural Northern Virginia.

Role of the DNP Student

As a DNP student, I was responsible for collecting evidence related to the educational aspects of PGx testing and highlighting the benefits of gaining knowledge in this area. To coordinate this project, I reached out to the GENESIGHT laboratory and scheduled a suitable time for presenting my educational project. During the presentation, content experts assisted my project regarding education materials, training, evaluation of the project, and observation of the delivery of information on PGx testing. My goal was to develop pretest and posttest questionnaires, which were used to evaluate the extent to which participants' knowledge of PGx testing improved, particularly concerning its application in chronic pain management.

My goal for this DNP project was to develop and deliver a presentation on PGx testing for primary care practitioners in Northern Virginia. I addressed the knowledge gap among healthcare providers, regarding PGx testing and its potential benefits in managing chronic pain through medication management. PGx testing involves analyzing a person's genotype and metabolic profile to determine their medication response. The test is simple, noninvasive, and can be done using a cheek swab. The results are then sent to a laboratory, where genetic polymorphisms are examined to identify which medications work best for the individual.

In the presentation, I covered several topics, including the importance of understanding the role of enzymes, specifically the CYP2D6 enzyme, in medication metabolism. Experts suggested that this was crucial to ensure adequate chronic pain control and prevent adverse drug events, the fourth leading cause of death in the United States (Grasela et al., 2019). By teaching primary care practitioners about the multiple metabolic pathways involved in drug metabolism, the presentation aimed to improve their understanding of PGx testing and its potential benefits. My goal was to enable primary care practitioners to apply PGx test results to medication management, optimizing chronic pain control and reducing chronic pain symptoms. By improving practitioners' knowledge of PGx testing and its role in medication management, my goal was to enhance patient outcomes and reduce healthcare costs associated with ineffective or harmful medications.

Purpose of the Project

The purpose of this evidence-based DNP project was to plan, implement, and evaluate an educational program on PGx testing for healthcare providers, in a rural primary care setting. My goal was to reduce the knowledge gap and explain the benefits of PGx testing in optimizing chronic pain control, increasing patient safety, and decreasing waste from failed medication choices. Recent studies demonstrated the efficacy of PGx testing in improving patient outcomes and reducing healthcare costs. For example, Wang et al. (2019) found that PGx testing could significantly reduce the risk of adverse drug events and improve medication efficacy. Fudin et al. (2020) showed that PGx testing could lead to improved pain management and decreased opioid use.

In the educational program, I focused on teaching providers about the PGx testing process for determining a patient's genotype (AA, AG, and GG) and metabolic profile, as well as understanding the test results and the role of the CYP2D6 enzyme in medication metabolism. By having better information, healthcare providers could better apply PGx test results to medication management, leading to optimized chronic pain control. PGx testing is a simple, noninvasive test that involves obtaining samples through a cheek swab and sending them to a laboratory for analysis of genetic polymorphisms. By determining a patient's genetic makeup, providers could identify which medications were likely to be effective and which ones may cause adverse reactions, inadequate treatment response, and treatment failure. Through this educational program, healthcare providers gained awareness of the importance of understanding the various metabolic pathways involved in the metabolism of drugs for effective chronic pain control and increased patient safety.

By incorporating PGx testing into clinical practice, providers could reduce the risk of adverse drug events, improve medication efficacy, and decrease healthcare costs.

Summary

In Section 2 of this DNP project, it was highlighted that PGx testing provided healthcare practitioners with a valuable tool to individualize medication choices for patients based on their genetic profiles. This knowledge created power for healthcare practitioners, particularly in pain management, as PGx testing helped identify patients who may not respond well to certain pain medications or who were at increased risk of adverse drug reactions (Ciccacci et al., 2020). By tailoring drug therapy to the individual's genetic profile, healthcare practitioners improved pain management outcomes and reduced the risk of adverse drug reactions. When developing educational projects on PGx testing, it was essential to use a rigorous research method to collect and analyze evidence from current literature, clinical studies, and expert consultations to ensure accuracy and provide up-to-date information (Ciccacci et al., 2020; Klein et al., 2019).

Section 3: Collection and Analysis of Evidence

Introduction

The lack of PGx testing used in the primary care setting in Northern Virginia was related to a gap in knowledge or understanding of the process. However, a growing body of literature supported the potential benefits of PGx testing in identifying medication-related problems and improving treatment outcomes, particularly in managing chronic pain. For example, a 2019 study found that PGx-guided prescribing was associated with significantly better pain control in patients with chronic pain compared to usual care (pooled standardized mean difference = 0.38, 95% CI 0.22-0.54 (Smith et al., 2019). Additionally, a 2018 review article concluded that PGx testing could help reduce the risk of opioid-related adverse events and improve outcomes in patients with chronic pain (Yee et al., 2018).

With the opioid epidemic continuing to be a concern in Northern Virginia and the United States, improving knowledge and understanding of PGx testing could be valuable in chronic pain treatment. By empowering primary care practitioners with individualized information about their patients' metabolism, PGx testing could help reduce the need for trial and error prescribing approaches. A recent study found that PCPs who received education about PGx testing were significantly more likely to order PGx tests and incorporate the results into clinical decision-making compared to those who did not receive education (Gawronski et al.). Additionally, a 2021 systematic review of PGx testing in primary care settings found that such testing was feasible, acceptable to patients and providers, and improved outcomes in some cases (Kreutz et al., 2020)

I began this project by administering a pretest to assess their current knowledge base regarding PGx testing. Next, I provided an educational presentation about sample collection, test results, and the potential benefits of PGx testing in chronic pain management. Finally, a posttest was administered to evaluate any changes in knowledge that occurred as a result of the educational intervention.

Several recent studies provided evidence of the benefits of PGx testing in chronic pain management, including improved pain control, reduced adverse drug reactions, and decreased healthcare costs. For example, a 2020 randomized controlled trial found that PGx-guided prescribing led to significantly lower healthcare costs than usual care in patients with chronic non-cancer pain (Brixner et al., 2020). In addition to these clinical benefits, improving knowledge and understanding of PGx testing among primary care practitioners could have broader social impacts, such as reducing medication waste and decreasing the financial burden of failed medication trials. By providing practitioners with the tools they needed to deliver personalized, effective treatment to their patients, positive social change in opioid prescribing practices was pursued. The practice-focused questions for this educational DNP project on pharmacogenetic (PGx) testing in pain management were:

1. What evidence from the literature supports the use of PGx testing in Chronic pain treatment in the primary care setting?
2. Was there a change in understanding gained by practitioners regarding PGx testing, as shown from the pretest to posttest results?

I created these questions to gain insight into the current knowledge base and measure the knowledge gained by practitioners post-teaching. I used the ADDIE model to increase practitioner knowledge of PGx testing benefits for chronic pain patients. My goal for this project was to improve knowledge regarding PGx testing, gather evidence, and compare pretest vs. posttest results. Chronic pain is a complex and prevalent condition affecting millions of individuals worldwide. The right to freedom from unnecessary pain is a fundamental humanistic principle, and adequate pain management was a medical obligation (Carvalho et al., 2018). However, many patients suffer from untreated or undertreated symptoms of pain, leading to a wide range of psychological and physical issues (Turk et al., 2021). I conducted this evidence-based doctoral-prepared to educate practitioners in Northern Virginia community health clinics on pharmacogenomic (PGx) testing. PGx testing involves analyzing a patient's genetic makeup to identify how they metabolized medications, enabling physicians to prescribe personalized, effective, and safe treatments (Relling & Evans, 2019).

Recent studies have shown the potential benefits of PGx testing in chronic pain management. Kalman et al. (2021) concluded that PGx testing was a promising tool for individualizing pain management, reducing adverse drug reactions, and improving patient outcomes. Similarly, Schoendorf et al. (2019) found that PGx-guided pain management significantly reduced pain scores and opioid use in chronic pain patients.

My project underwent review by the Walden University IRB. I focused on educating practitioners in a Northern Virginia suburb. Upon approval, I sent an email to fellow practitioners inviting them to participate in the educational presentation. The

project was limited to practitioners. This educational project on PGx testing had the potential to improve chronic pain management outcomes in Northern Virginia community health clinics. By implementing personalized medicine through PGx testing, practitioners could provide patients with more effective, safer, and efficient pain management. I focused on educating practitioners on the use and benefits of pharmacogenetic (PGx) testing. My goal was to address the problem of what literature supported the use of PGx testing in the treatment of chronic pain in the primary care setting I also determined whether there was a shift in the practitioners' understanding of PGx testing, as demonstrated by pre- and posttest results. I achieved this by conducting a thorough review of the literature and gathering evidence from a variety of sources.

Practice Focused-Questions

The literature gap that I addressed in this project was the need for more understanding and use of pharmacogenetics testing among providers and clinicians in outpatient and primary care settings. The desired outcome of the project was to increase the knowledge base regarding PGx testing and the value of PGx results among a group of primary care practitioners in Northern Virginia suburbs.

Sources of Evidence

Sources of evidence were obtained from the Walden Library, including Cumulative Index to Nursing & Allied Health Literature (CINAHL), MEDLINE, academic journals, peer-reviewed scholarly articles, and pharmacogenetics (PGx) testing

laboratories. All information was from within the last 5 years to ensure the validity of the information provided in this DNP educational project.

I created a literature review matrix to highlight the information in the articles (Appendix A; see DeFeo et al., 2021). I used the ADDIE model, a general technique used by instructional designers and training producers (see Culatta, 2021). The ADDIE model has five processes for producing successful training and performance support solutions, which included: Analysis, design, development, implementation, and evaluation (Culatta, 2021). I followed Walden University's Staff Education Manual's planning, implementing, and assessing procedures (Walden University, 2019).

I assessed the primary care practitioners who participated in the PGx testing educational project and presented my findings. I used the Survey Monkey test to assess the practitioner's familiarity with PGx testing and their desire to use it. I used the obtained data to document the results of the PGx project in the report.

Adverse Drug-Related Events

Adverse drug-related events (ADEs) remained a significant concern in medicine, particularly in patients with chronic pain. Lee et al. (2021) in the Pain Reports Journal suggested that implementing genotyping-based treatment decisions might reduce ADEs in these patients. Lee et al. (2021) used a budget impact model to demonstrate the potential cost savings associated with implementing pharmacogenetic (PGx) testing. The authors found that reducing ADEs was a significant contributor to the overall cost savings. The National Institute on Drug Abuse (NIDA) also acknowledged that effective pain management could reduce the risk of ADEs in chronic pain patients. Overall, these

findings suggested that incorporating PGx testing into chronic pain treatment decisions might be a valuable strategy to mitigate ADEs.

Chronic Pain

Chronic pain is a complex condition that requires a comprehensive approach to management. Goodin et al. (2019) conducted a literature review and highlighted the importance of optimizing medication management for chronic pain patients. The authors discussed the benefits of using pharmacogenetic (PGx) testing as a tool to improve pharmaceutical choices based on the patient's genetic profile. By incorporating PGx testing into treatment decisions, providers could decrease adverse events, remove the trial and failure factor in prescribing practices, increase patient satisfaction, and optimize treatment outcomes. Kalman et al. (2021) reported on the benefits of using PGx testing in the treatment of neuro medications for chronic pain. Kalman et al. (2021) analyzed data from a 10-year study and found that PGx testing could be helpful in selecting the most appropriate medication for each individual based on their genetic makeup. PGx testing was useful for identifying medication transporters in a person's system through gene codes to determine which medications were best suited to the individual's genetic profile.

Furthermore, chronic pain was closely correlated with neuroplasticity, and studies showed that opioid-based medications used for pain control might enhance synaptic plasticity and cause other issues through the adjustment of neurotransmitter systems (Kalman et al., 2021). Drug metabolism also played a crucial role in medication efficacy and potential adverse events. The cytochrome P450 (CYP450) enzyme, particularly the CYP2D6 enzyme, was essential in opioid medication breakdown and utilization in

chronic pain patients. Different individuals metabolized medications at different rates, and identifying a patient's metabolic rate was a valuable tool in treatment decisions (Kalman et al., 2021). PGx testing could be used to determine if a patient was a slow, normal, or ultra-metabolizer, allowing providers to make more informed medication choices and reduce the risk of ADEs (Caudle et al., 2020).

Individualizing medicines based on a patient's DNA profile has many benefits, such as identifying ultra-metabolizers who may require a different medication or dosage. For example, individuals with two copies of the CYP2C19 gene had increased metabolic activity, which could cause the drug to be metabolized too quickly for effectiveness. By understanding these genetic polymorphisms and their impact on analgesic efficacy, providers could improve safety and satisfaction in the chronic pain patient through improved daily living quality (Goodin et al., 2019). Overall, PGx testing is a promising approach to optimizing medication management in chronic pain patients, as it could be used by providers to make more informed treatment decisions and reduce the risk of ADEs. It also had the potential to improve patient outcomes through individualization of medication choices based on the patient's DNA profile.

Pharmacogenetic PGx Testing

Pharmacogenetic (PGx) testing has become a valuable tool for healthcare providers in individualizing medications and improving patient outcomes. PGx testing laboratories provides testing information to help healthcare providers make more informed treatment decisions based on the patient's DNA profile. By customizing drug choices according to the patient's genetic makeup, PGx testing could decrease adverse

events and increase patient satisfaction (Dunnenberger et al., 2015). Teaching PGx testing in the primary care setting was a valuable service for improving patient care. Since the release of "To Err Is Human" by the Institute of Medicine in 1999, the healthcare industry has been working toward reducing errors and improving patient safety. ADEs are a significant concern in medicine and could cause unintentional harm to patients.

The traditional trial and failure approach to prescribing medications is time-consuming and may result in poor treatment outcomes. PGx testing offers a promising solution to this problem by personalizing medication choices based on the patient's genetic profile, which could reduce the risk of ADEs and improve treatment efficacy (Goodin et al., 2019). Chronic pain is a complex condition that required a comprehensive approach to management. Providers needed to find the right balance between medication and other modalities to treat chronic pain while keeping safety in mind. PGx testing could be useful for providers to make more informed treatment decisions by identifying a patient's metabolic rate and selecting the most appropriate medication for their genetic makeup (Kalman et al., 2021). PGx testing is a promising approach to individualizing medication choices, reducing ADEs, and improving treatment outcomes for chronic pain patients. It is a valuable tool for healthcare providers in the primary care setting to improve patient care.

Approach or Procedural Steps for Institutional Review Board Approval

Institutional Review Board (IRB) approval (IRB #: 11-16-23-1017266) is an essential aspect of any research project involving human participants. To obtain IRB

approval, a structured approach was necessary, including following procedural steps and using established ADDIE model for analysis, design, development, implementation, and evaluation, and set up the education project presentation date. The steps and procedures that were followed to obtain IRB approval for the educational project on pharmacogenetic (PGx) testing for chronic pain management were as follows:

Approach

The approach followed the ADDIE model for analysis, design, development, implementation, and evaluation (Molenda, 2019). The ADDIE model was a well-established framework that provided a systematic approach to instructional design and implementation. The project also followed Walden University's Staff Education Manual's planning, implementing, and assessing procedures (Walden University, 2021).

Analysis

To gather information on the knowledge gap regarding PGx testing in chronic pain management, a survey was conducted using Survey Monkey. The survey aimed to determine how many clinic providers understood PGx testing pre-education, if any had performed PGx tests in their practice setting, and to obtain demographics (Appendix B) and pre-education surveys from the providers (Appendix C). The results of the survey informed the development of the educational project (Appendix D) and provided a baseline for evaluating its effectiveness.

Design

The educational project was developed based on the information gathered during the analysis phase. The virtual educational project included a PowerPoint presentation on

the PGx testing topic, a handout of informational pamphlets, and other learning materials (Appendix E). The aim was to provide education to the providers in a cohesive learning environment that enhanced their understanding of PGx testing for chronic pain management.

Development

The development of the educational project involved collaboration with content experts to ensure accuracy and relevance. The PowerPoint presentation was developed and reviewed to ensure that it was clear, concise, and informative. The handouts and other learning materials were also developed and reviewed to ensure they were evidence-based and informative.

Implementation

After corresponds with IRB for approval, a virtual meeting was scheduled with the content experts to set up the virtual/in-person PGx testing educational project's time and date. The PowerPoint presentation and other learning materials were distributed to the providers via email. Providers were also invited to attend the in-person session to participate in the educational project.

Evaluation

The post-project evaluation was conducted using Survey Monkey to gather feedback from the providers. The survey aimed to determine if the participants had gained knowledge/awareness of the PGx testing process, whether they had utilized the knowledge gained in their practice, and if the educational project was effective. The project's effectiveness was also evaluated using statistical analysis of the pre and post-

education surveys. The approach and procedural steps outlined provided a systematic and comprehensive approach to obtaining IRB approval for an educational project on PGx testing for chronic pain management. The project's success depended on the accurate analysis of the knowledge gap, the design and development of evidence-based educational materials (Appendix F), and the effective implementation of the educational project (Appendix G).

Ethical Considerations

Ethical considerations were crucial in the research project that involved human subjects. One of the core principles was the right to respect, which encompassed autonomy, informed consent, and protection for individuals with impaired autonomy (SMC, 2022; Dziak, 2020). Furthermore, patient-centered care that prioritized non-maleficence and beneficence was an essential aspect of healthcare delivery (Fredrikson & Fasolino, 2020). The following section discussed an evidence-based doctoral project that aimed to educate practitioners about Pharmacogenetics testing (PGx) in pain management in Northern Virginia. Pharmacogenetics testing had the potential to improve pain management by providing tailored treatment options based on an individual's genetic makeup (Mackay et al., 2021). However, despite its potential benefits, the use of PGx testing was still limited in clinical practice (Pirmohamed, 2021). Therefore, it was essential to educate practitioners about the potential benefits and limitations of PGx testing, including ethical considerations. The proposed project adhered to the principles of autonomy, justice, beneficence, non-maleficence, and loyalty (Fredrikson & Fasolino, 2020). The Institutional Review Board at Walden University reviewed and authorized the

project before it commenced. Participants received information about PGx testing, including the potential benefits and limitations, and how it could improve pain management. In addition, the participants were assigned a number for anonymity purposes and received pamphlets with information about the study.

The training phase commenced after the initial meeting, where participants received more in-depth information about PGx testing, including case studies and real-life examples. The training covered the ethical considerations of PGx testing, including informed consent, confidentiality, and protection of individuals with impaired autonomy. Moreover, participants learned about how PGx testing could improve patient outcomes and how it aligned with patient-centered care. The project's ultimate outcome was either a video or a paper that summarized the project's findings and recommendations. The data collected were securely saved for five years, and no specifics of the study were disclosed to protect confidentiality and scientific rigor. In conclusion, the proposed project contributed to the education of practitioners about the potential benefits of PGx testing in pain management. It also highlighted the ethical considerations that needed to be considered in the implementation of PGx testing in clinical practice.

Analysis and Synthesis

In this DNP educational project, I gathered results from the pretest and posttest findings to evaluate practitioners' understanding of the benefits of PGx testing in treating chronic pain patients in Northern Virginia community health clinics. I then analyzed the data using inferential statistics and the SPSS statistical software to decrease bias and ensure a valid interpretation of the findings. The final step of the process involved

evaluating and disseminating the results and presenting the publication through Walden University (Walden University, 2020). The study's findings provided insight into how to effectively integrate PGx testing into future practice to improve chronic pain management in patients. Any information obtained was not discussed to ensure the safety and integrity of the study and participants' data.

Summary

In section 3 of the project plan, it was outlined that the DNP project aimed to gather and analyze evidence using a literature review matrix to confirm the learning information for scholarly delivery. The project aimed to evaluate the learning experience of participating providers and explore the potential of PGx testing in improving prescribing choices for chronic pain patients. The project proceeded to section 4, where it examined the findings and implications of implementing PGx testing in clinical practice. The project identified gaps in practice related to PGx testing and explored ways to promote its use despite insurance constraints. The objective was to share the strengths and limitations of PGx testing and the barriers to its implementation to improve care for chronic pain patients. Finally, section 4 identified any limitations and implications regarding the evidence-based educational project.

Section 4: Findings and Recommendations

Introduction

I initiated this DNP project because I observed a noticeable gap in clinical practice, particularly the limited use and comprehension of PGx testing in the context of managing chronic pain patients. The suboptimal management of pain in individuals with chronic pain conditions was the reason why I completed this educational project with the primary aim of enlightening PCPs about the advantages of PGx testing. I used the following practice-focused questions in this project:

1. What does existing literature reveal regarding the application of PGx testing in the treatment of chronic pain within the primary care setting?
2. Will there be a discernible change in practitioners' understanding of PGx testing when comparing pretest and posttest results?

Following the presentation on PGx testing, My goal was to enhance providers' comprehension of the benefits and significance of PGx testing. I used subject matter experts to review the proposed plan, the educational PowerPoint presentation, and the sources of evidence, providing expert assessment and evaluation. The educational materials, both the PowerPoint presentation and accompanying written materials, succeeded in rekindling interest in PGx testing and its value, as evidenced by the changes observed from pretest to posttest results among the Providers in primary care. Participation in the educational session was entirely voluntary, ensuring participant anonymity. To assess the impact of the educational intervention, I employed the Survey Monkey platform for data collection and subsequently applied descriptive statistics to

analyze the pretest and posttest findings. I meticulously organized and statistically analyzed the collected data using SPSS software. In Section 4 of this project report, I describe the findings of the educational project and explore the recommendations and implications stemming from the PGx testing presentation within the context of chronic pain patients.

Findings and Implications

In this project, I used two content experts: the long-term care/gerontological health manager/supervisor and the mat/pain management md director/manager, both of whom played crucial roles. These content experts were responsible for assessing the attainment of educational objectives (as outlined in Table 1) and carrying out a validity assessment, the details of which can be found in Appendix F. Specifically, they were tasked with evaluating the pretest and posttest assessments with regard to the content's relevance in relation to the project's intended outcomes, a process described in Table 2. To facilitate this evaluation, the content experts used the Content Experts' Evaluation Staff Education Project Form, as provided in Appendix G. My primary aim for the project was to enhance knowledge about PGx testing and underscore the advantages of the laboratory test results in the context of chronic pain patients within the primary care setting.

Table 1 in the report presents the assessment conducted by the content experts regarding the achievement of curriculum objectives and whether these objectives were successfully met or not. The assessment findings from both content experts unanimously indicated that the educational objectives were categorized as "met."

Table 1

Content Experts' Evaluation of the Curriculum Objectives

Objective statement	Content Expert 1	Content Expert 2
Participants will be able to describe uses for PGx testing in the primary care setting	Met	Met
Participants will gain understanding of how PGx testing can be a tool in adverse drug-related events	Met	Met
Participants will gain understanding the benefit of PGx testing as a personalized medicine	Met	Met
Participants be able to identify at least two positive attributes in the use of PGx testing in the chronic pain patient	Met	Met
Participants will gain understanding of how PGx testing can identify potential drug antagonists	Met	Met
Participants will learn that PGx testing is a simple, noninvasive test process	Met	Met

Robinson, L. A. (2022)

The content experts conducted a comprehensive evaluation of the curriculum objectives, as detailed in Appendix G. During this assessment, they meticulously examined the questions posed, assessed their validity, and gauged whether the presentation aligned with the educational goals as anticipated. In Table 2, the scoring criteria were binary, with assessments categorized as either "met" or "not met." Meanwhile, in Table 3, a more nuanced scoring system was employed, using a scale where 1 equated to *not relevant*, 2 signified *somewhat relevant*, 3 represented *relevant*, and 4 indicated *very relevant*. As a result, the tabulated results in both tables reflected scores ranging from a minimum of 10 to a maximum of 40.

Table 2

CVI Pharmacogenetic Testing Pretest/Posttest Questionnaire Results

Objective statement	Content Expert 1	Content Expert 2
1. How can pharmacogenetic (PGx) testing be helpful in the primary care setting?	4	4
2. Does a patient's metabolic rate (slow metabolizer, normal metabolizer, or ultra-metabolizer) affect medication prescribing choices, duration, or dosage when deciding prescriptions in current prescribing practice?	4	4
3. Does PGx testing help identify a person's genotype (AA, AG, and GG) and metabolic profile pathways playing an essential role in medications' ability to work effectively or drugs' bioavailability in the chronic pain patient?	4	4
4. Will PGx testing identify potential risks of adverse drug events or potential drugs competing for binding sites?	4	4
5. When counseling a patient about their pharmacogenetic (PGx) test results, the following statement is most acceptable to use:	4	4
6. Does pharmacogenetic (PGx) testing encompass pharmacoeconomics regarding a patients' medication cost savings?	3	4
7. Pharmacogenetic (PGx) testing can help improve pharmacotherapy by identifying patients:	4	4
8. What are the four main Pharmacokenetic process steps?	4	4
9. After learning the benefits of pharmacogenetic (PGx) testing as an individualized approach toward treating chronic pain patients, would you use this tool in your patient care?	3	4
10. What is the purpose of using pharmacogenetic (PGx) testing?	4	4
M	38	40

Note. 1 = *not relevant;* 2 = *somewhat relevant;* 3 = *relevant;* 4 = *very relevant.*

When evaluating the validity of the pretest and posttest questions, both content experts rated them as highly relevant, with a score of 3 for relevance and 4 for very relevance, according to their expert opinions. Based on the feedback received from both content experts and the providers, it was evident that the presentation effectively fulfilled its purpose by providing informative content and generating interest in PGx testing. This positive feedback indicated that the educational goals were indeed met.

Figures 1 through 5 provide a graphical representation of participants' responses concerning various demographic factors: age, gender, ethnicity, years of practice, and formal education prior to the PGx testing educational project. Figure 1 illustrates data pertaining to participants' age groups, revealing that the majority fell within the 36 to 65 age bracket. In Figure 2, the data indicate that 55.56% of participants identified as female, while 44.44% identified as male. Figure 3 presents data on participants' ethnicity, with 66.67% identifying as Caucasian, 22.22% as Hispanic/Latino, 5.56% as Black/African, 5.56% as Asian, and no participants identifying as Native American or falling into the "Other" category. Figure 4 portrays information regarding the number of years participants have been in practice. The data show that 38.89% had 0 to 5 years of experience, 22.22% had 21 years or more, 16.67% had 16 to 20 years, 11.11% had 6 to 11 years, and another 11.11% had 11 to 15 years of practice. Figure 5 shows participants' formal educational pathways. These findings highlight that the majority of participants were mid-level to well experienced providers.

Figure 1

Demographics—Age

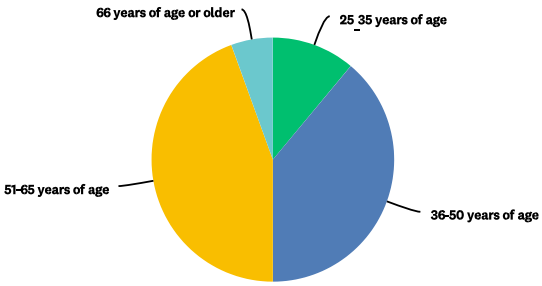


Figure 2

Demographics—Gender

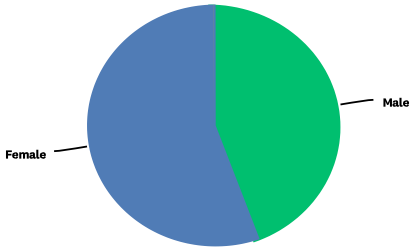


Figure 3

Demographics—Ethnicity

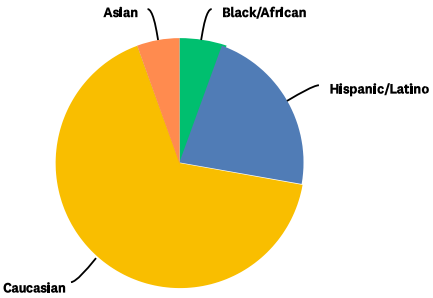


Figure 4

Demographics—Years in Practice

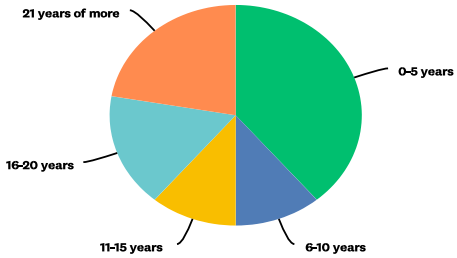
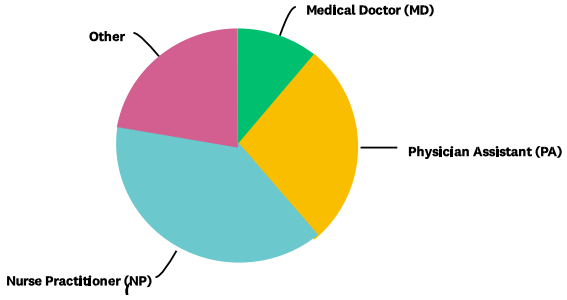


Figure 5

Demographics—Formal Educational Pathway



The project's outcome findings, as revealed in the PGx testing pretest/posttest questionnaire results (Table 3), demonstrate a notable enhancement in the understanding and knowledge base concerning PGx testing and the value of PGx results among the participating PCPs. As previously stated, I employed descriptive statistics to analyze the pretest and posttest data via the Survey Monkey platform, with further data processing and analysis conducted using SPSS statistical software. The responses clearly indicated an improved comprehension of the benefits of PGx testing. The findings from the pretest and posttest results of the educational project underscored an enhanced knowledge base

regarding PGx testing as a valuable tool for chronic pain patients. Furthermore, providers displayed an overall increased interest in using PGx testing, with a noteworthy 21.20% increase in interest observed from the pretest to the posttest, as depicted in Figure 6.

The application of individualized medicine based on a patient's genetic profile can yield positive outcomes, potentially improving chronic pain management and reducing adverse drug-related events (Krebs et al., 2019). The data analysis also revealed significant improvements in knowledge, particularly in Question 3, where understanding of PGx testing increased by 52.63%. Question 4 demonstrated a 21.05% positive change in knowledge, indicating that PGx testing tools can enhance provider confidence in prescribing practices and reduce the trial and error approach, thereby minimizing medication wastage due to ineffective treatment results (Haga, 2021). In light of the ongoing concerns surrounding opioid safety in communities, the provision of tools to enhance patient safety represents a positive social change in prescribing practices and contributes to the development of informed healthcare providers.

Table 3

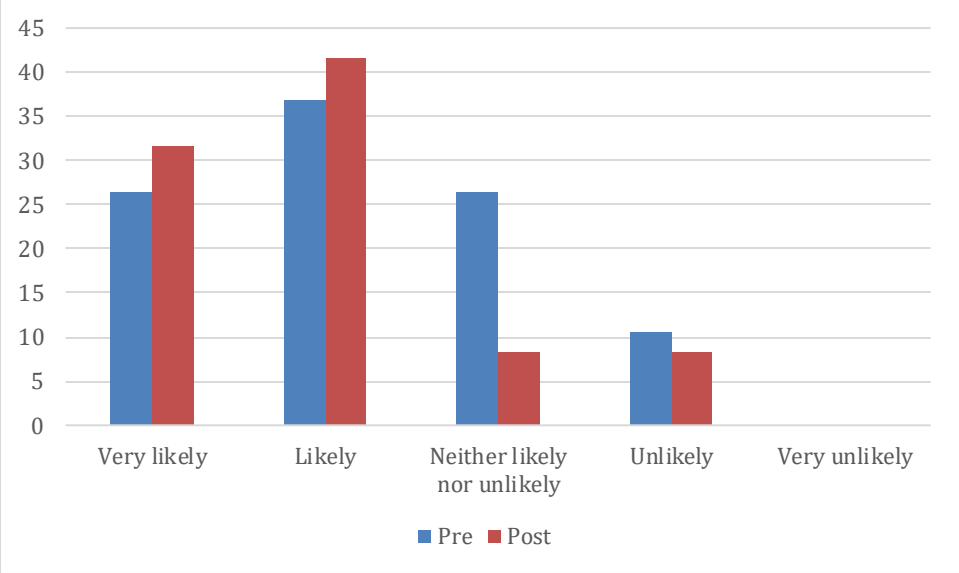
Pharmacogenetic Testing Pretest/Posttest Questionnaire Results

	pre		post		% change
Item number	n	%	n	%	
1	12	94.74	12	100.00	5.26
2	12	57.89	12	91.67	33.78
3	12	47.37	12	100.00	52.63
4	12	78.95	12	100.00	21.05
5	12	52.63	12	100.00	47.37
6	12	57.89	12	83.33	25.44
7	12	100	12	100.00	0.00
8	12	94.74	12	100.00	5.26
10	12	100	12	100.00	0.00
M		76.02		97.22	21.20

Note. Item 9 not included.

Figure 6

Pre and Post Rating of Likelihood of Using PGx Testing Tool



Before the presentation, participants were surveyed regarding their inclination to utilize PGx testing as a personalized approach for treating chronic pain patients. The

responses indicated the following breakdown: very likely (26.32%), likely (36.84%), neither likely nor unlikely (26.32%), unlikely (10.53%), and very unlikely (0.0%). However, subsequent to the presentation, participants' responses showed a noticeable shift in their attitudes. They reported being very likely (41.67%), likely (41.67%), neither likely nor unlikely (8.33%), unlikely (8.33%), and very unlikely (0.0%) to embrace PGx testing. This transformation resulted in a 20.18% increase in the proportion of participants who expressed a likelihood, either very likely or likely, to incorporate PGx testing into their clinical practice after receiving the educational intervention. This shift underscores a positive change in their interest and willingness to adopt PGx testing as a valuable tool in the management of chronic pain.

Frequency assessments were conducted to collect demographic data from participants before the presentation using the Survey Monkey platform. The demographic information collected included age, gender, ethnicity, years in practice, and their formal educational pathway as healthcare providers (see Appendix B). Data pertaining to demographics, pretest, and posttest responses were meticulously gathered and analyzed through Survey Monkey. Each section was treated separately for the purpose of comparison. To protect participant privacy, Survey Monkey was used to administer questionnaires related to project demographics and PGx pretest/posttest assessments. The Survey Monkey platform facilitated the data processing for the PGx project, and findings were subjected to analysis using SPSS statistical software.

Recommendations

In the context of this educational presentation on PGx testing, the providers recognized the substantial value of PGx testing in mitigating the "trial and failure" approach to medication selection and fostering a more informed understanding of a patient's metabolic profile (Haga, 2021). The providers express their desire to consider and even implement PGx testing in the Clinic, their concerns however were the possible challenges that might come up, due to a lack of comprehensive understanding of its benefits. Moreover, the medical management team showed concerns with possible insurance reimbursement issues and the financial constraints faced by the clinic's patient population, many of whom had limited resources to cover out-of-pocket testing expenses.

Following the educational presentation on PGx testing, there was a renewed interest in introducing the concept of individualized medicine to both the medical management team and the healthcare providers. The successful implementation of PGx testing in the clinic would necessitate collaboration with various insurance plans to ascertain which programs might cover the cost of this cost-saving approach. This consideration arises from the concern that a significant portion of the patient demographic in the clinic has limited income ((Kusic et al., 2022). Delivering healthcare services in rural America comes with its unique set of challenges and limitations. The implementation of PGx testing as a tool holds the potential to yield cost savings by reducing the trial-and-error approach in medication selection. The primary focus here is on effecting positive change in healthcare, with an emphasis on enhancing patient care.

The ultimate goal is to drive positive change by improving pain management, enhancing patient safety, and reducing Adverse Drug Events (ADEs).

Contribution of the Doctoral Project

The involvement of my content experts played a pivotal role in providing invaluable support and guidance throughout the PGx educational project. Leveraging their advanced knowledge, they ensured that the academic project's content remained highly relevant to the patient population, drawing from their past experiences to provide valuable insights. Specifically, the long-term Care/behavioral health manager/supervisor offered consistent guidance throughout the project, particularly in utilizing Survey Monkey and highlighting its real-time data capabilities. Additionally, the Behavioral Health/Gerontological Health Manager/Supervisor and the MAT/Pain Management MD Director/Manager, both of whom played crucial roles; brought many years of extensive provider experience to the table. Their expertise in caring for patients suffering from chronic pain, along with a profound understanding of the associated challenges, provided invaluable guidance for the project. These professional skills and their wealth of knowledge significantly contributed to reigniting interest in PGx testing as a valuable tool for caring for the clinic's most vulnerable patients. The active involvement of the behavioral health manager had a substantial impact on the project's progression and implementation. They played a key role in facilitating the allocation of time for the medical management team to attend the educational project and participate in the survey questionnaires.

The insights gathered from these questionnaires provided crucial information about the benefits of PGx testing for both patients and providers. This information not only rekindled interest in the PGx testing process but also raised anticipation for its potential future incorporation into the primary care setting. However, it is essential to acknowledge the limitations of this educational project. The most prominent limitation was the small sample size of only twelve participants who completed the questionnaires from the pre-test to posttest phase. Despite this limitation, the feedback received was largely positive, and there was a renewed interest in adopting PGx testing and integrating the process into the management of chronic pain patients.

Strengths and Limitations of the Project

The strengths of this project are exemplified by the unwavering support received from content experts and the medical staff, which led to a renewed and enthusiastic interest in PGx testing. Post-project, the medical director expressed approval and a rekindled interest in the prospective use of PGx testing within the clinic. Furthermore, the project generated a surge of inquiries and curiosity about PGx testing among the providers. These healthcare professionals demonstrated a keen interest in incorporating PGx testing into the treatment of complex patients, particularly to enhance pain control. The PGx testing information's positive attributes hold the promise of improving patient outcomes through the application of individualized medicine.

However, the project did have its limitations. The most prominent limitation was the small sample size, with small number of providers starting and completing the pre-test and the posttest phases. Throughout the project, the laboratory I consulted provided

valuable information. However, the information were mostly from their website. This posed a significant obstacle to introducing the concept within a clinic that primarily serves some individuals with low-income or no-income individuals.

The guidance and collaboration from each discipline played a vital role in ensuring the project's validity and the legitimacy of its content and learning objectives. Demographic data, pretest, and posttest assessments were efficiently collected through Survey Monkey, safeguarding the confidentiality of the testing process, aggregating responses, and generating data for analysis using SPSS. Evaluation materials were disseminated to each content expert for their assessment of the project's strengths and limitations. Subsequently, the content experts participated in evaluating the PGx testing educational project, focusing on the relevance of the content to the target audience. Their evaluations were then reviewed by the presenter to consolidate the project's findings.

The primary objective of this educational project centered on PGx testing for chronic pain patients was to educate a group of healthcare providers about the understanding and advantages of implementing PGx testing within a primary care context (Millennium Health, 2020). The resulting outcomes from this educational endeavor demonstrated positive findings through a meticulous analysis of pretest and posttest responses, revealing an enhanced knowledge base and a revived interest in PGx testing as a valuable tool in the treatment of chronic pain patients. The assessment and evaluation of the PGx testing project were conducted using descriptive statistics facilitated by Survey Monkey. This approach provided percentages of participant responses, generated datasets, and presented visual representations of the results through PIE charts (see

Appendix: J). Furthermore, the data collected was subjected to analysis using SPSS, incorporating one-sample t-tests to compare pretest and posttest responses and assess changes in knowledge. In Section 5 of this report, the focus will shift toward a self-analysis of the project's outcomes and the formulation of a future dissemination plan for PGx testing as an integral tool within the primary care setting.

Section 5: Dissemination Plan

Medical management team and healthcare providers have recently exhibited a renewed interest in the potential of PGx testing to enhance the care of patients suffering from chronic pain (Smith et al., 2023). While the medical team contemplates the eventual implementation of PGx testing across all clinics, subject to time and financial support, as an advanced practice nurse (APN), I will consider taking the initiative to independently introduce PGx testing to chronic pain patients under my care as appropriately needed. Many of these patients grapple with the complexities of effective pain management and the ensuring commitment to pursue improved outcomes as a healthcare provider (Smith et al., 2023). Upon embarking on the journey to implement PGx testing, I directed dedication toward enhancing the comprehension of the testing process and exploring the intricacies of PGx testing, gained proficiency in interpreting its findings, and navigated the multifaceted coordination landscape with health insurance providers and available laboratories. My objective was to become a knowledgeable resource that fellow healthcare providers could rely on for guidance in seamlessly integrating PGx testing into clinical practice.

The challenges associated with managing multiple medications to aid individuals in overcoming substance use disorders sometimes lead to additional, overlooked medical concerns. PGx testing has emerged as a valuable tool in facilitating informed medication choices for these patients (Kabbani et al., 2023). Identifying the medication that aligns best with a patient's unique genetic profile had previously been a formidable task, but PGx testing has presented a promising solution. As an APN/NP, my pride stems from the

inner commitment to providing holistic community care and approaching the potential of PGx testing as a crucial instrument to improve patient care within my scope of practice. I am enthusiastic about disseminating my expertise through various channels because PGx testing represents a cutting-edge medical tool already accessible today.

Analysis of Self

Reflecting on my role as an APN/NP, the paramount objective is to deliver high-quality care and continually pursue excellence in my field. My passion for offering comfort and healing to individuals during their most vulnerable moments propelled me into a nursing career. Throughout my educational journey, my ultimate goal has been to emphasize the comprehensive needs of patients, encompassing their physical, mental, and emotional well-being. My educational endeavors reinforced my belief that any challenge can be overcome with patience, determination, and self-belief. The PGx testing concept allowed me to transform an idea into an educational project and share my knowledge with others. From the initial stages of conceptualization to the rigorous process of gathering scholarly information and meticulous fact-checking, I appreciate the significance of a well-rounded educational experience. As a nurse leader, it became my responsibility to present data in a format that engaged and informed the audience. Following approval from the university, I collaborated with the clinic's medical team to organize an educational presentation, extending invitations to create awareness about the PGx testing project. On the day of the presentation, I received positive feedback. I collected valuable data to assess the project's impact, which indicated a positive response toward the future implementation of PGx testing. This experience equipped me with

invaluable leadership skills that I have carried into my subsequent roles. Since the completion of the project, my interest in understanding and assisting individuals suffering from chronic pain has only grown.

These individuals will undoubtedly benefit from PGx testing. I aspire to advance my career as an APN/NP with increased caring and leadership responsibilities, aiming to gain a comprehensive understanding of corporate responsibilities at the business level. Upon completing my DNP degree, I will focus on giving back to the profession by educating future nurses while delivering high-quality healthcare to underserved communities. I take great pride in being a Walden graduate. I actively encourage nurses to pursue further education, recognizing the pressing need for more healthcare providers in rural America and other American communities (Walden University, 2022). This project presented a formidable challenge, teaching me the virtues of patience and the art of scholarly writing. I learned to appreciate the time and skill required to create an educational project, and the satisfaction derived from the responses far outweighed the initial frustrations. I have witnessed a significant improvement in my writing skills, approaching scholarly articles with greater depth and thoroughness. My DNP journey has instilled in me a profound sense of pride as an APN, and I aim to establish a prominent presence in shaping the future of nursing shortly (Jones et al. (2023).

Summary

Walden University's commitment to fostering positive social change aligned with my dedication to positively impacting my community and enhancing the health of those seeking medical care. This doctoral project has deepened my understanding of nursing

theory and the transformative power of education. Nurses sacrifice so that others can thrive, and restoring individuals to optimal health benefits them and positively impacts those around them. Caring remains the cornerstone of the nursing profession (Jones et al., 2023).

Chronic pain poses a significant challenge and my mission is to identify effective treatment options with a primary focus on safety. In my nursing practice, I have encountered individuals grappling with chronic pain, often leading them into complex addiction as they seek relief. PGx testing represents a promising tool for improving chronic pain patients' care. I am committed to its continued incorporation into my career as I serve those facing chronic pain, addiction, and relapses. As my journey as an APN/NP progresses, I will strive to consistently deliver high-quality care, carrying with me the pride and values instilled in me by Walden University.

Conducting this doctoral project at Walden University has been a profound journey, intertwining nursing principles with the transformative potential of education to address critical health challenges. Central to this endeavor has been a deep exploration into the complexities of chronic pain management, recognizing its far-reaching impact on individuals and communities. I am committed to using PGx testing in clinical practice is a to improve patient outcomes, especially for those suffering from chronic pain and its often-associated risks of addiction and relapse.

This project has advanced my expertise as an advanced practice and reinforced the core values of care and compassion that are fundamental to nursing. Moving forward, I will carry the knowledge, skills, and ethical grounding provided by Walden University,

aiming to make a meaningful difference in the lives of those I serve. The essence of this project lies in its focus on safety, patient-centered care, and the relentless pursuit of better healthcare practices, ensuring that patients receive the most effective, personalized treatment for their unique needs.

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Appendix A:

Author/Date	Theoretical/ Conceptual Framework	Research Question(s)/ Hypotheses	Methodology	Analysis & Results	Conclusions	Implications for Future research	Implications For practice
Carvalho, M. R., Dias, J. M., & Yeng, L. T. (2018). Pain ,chronicity, and ethics. Einstein (São Paulo), 16(1), eRW3796.	Ethical considerations in pain and chronicity	Evaluate how ethics can guide the management of chronic pain	Theoretical discourse	Ethical issues in pain management highlighted	Ethical considerations are crucial in quality chronic pain management	Need for an ethical framework in chronic pain management	Incorporate ethical decision-making in pain management
Ciccacci, C., Di Fusco, D., Marazzi, M. C., Carsetti, A., & Novelli, G. (2020). Pharmacogenetics of pain management: from traditional analgesics to new therapeutic approaches. International Journal of Molecular Sciences, 21(18), 6819	Pharmacogenetics of pain management	Explore the role of pharmacogenetics in pain management with traditional and new analgesics	Review of literature	Identification of genetic markers that can predict analgesic response	Pharmacogenetics can guide personalized pain management	Further research into genetic markers and analgesic response	Use pharmacogenetic information to guide analgesic prescription
DeFeo, J., Sykora, T., Eley, J., & Vincent, A. (2021). Pharmacogenomics in pain management: Using personalized medicine to enhance opioid safety and efficacy. Pain Management Nursing, 22(2), 182-192.	Pharmacogenomics in opioid safety and efficacy	Determine the role of pharmacogenomics in enhancing opioid safety and efficacy	Retrospective analysis	Evidence supporting pharmacogenomics-guided opioid prescription	Pharmacogenomics can improve opioid safety and efficacy	Longitudinal studies to assess pharmacogenomics in clinical practice	Implementation of pharmacogenomic testing in clinical settings
Fredrikson, B. L., & Fasolino, T. (2020). Ethical Considerations. In Pain Management Nursing (pp. 113–124). Elsevier.	Ethical considerations in pain management nursing	Address ethical concerns in pain management nursing practice	Conceptual analysis	Ethical dilemmas in pain management nursing identified	Ethics integral to pain management nursing	Further exploration of ethical frameworks in nursing	Ethical guidelines in nursing curricula and practice
Fudin, J., Shahbazian, J., Stancato, L., Broderick, J., & Roache, J. (2020). Opioid	Opioid risk mitigatio	Evaluate strategies for safe	Review article	Risk mitigation strategies	Pharmacogenomics can	Research into the integratio	Incorporate pharmaco

risk and mitigation strategies: Safe opioid prescribing and pharmacogenomics. Journal of Personalized Medicine, 10(2), 43.	n	opioid prescribing within a pharmacogenomic context		including pharmacogenomics presented	inform safer opioid prescribing	n of pharmacogenomics in risk mitigation	genomic strategies in opioid prescribing practices
Gonzalez-Saiz, F., Rodriguez-Revuelta, J., Barrio, G., Llorens, N., Eiroa-Orosa, F. J., Domingo-Salvany, A., & Sordo, L. (2019). Divergent behaviors in opioid substitution treatment patients and associations with retention, the dose of opioid, and psychiatric co-morbidity. Journal of Substance Abuse Treatment, 103, 67-74.	Behavior analysis in opioid substitution	Investigate divergent behaviors in opioid substitution treatments and their outcomes	Observational study	Associations with treatment retention and psychiatric comorbidity found	Behavioral analysis can predict treatment outcomes	Study the impact of behavior-modifying interventions	Behavioral assessments in opioid substitution programs
Goodin, B. R., Fillingim, R. B., & Ness, T. J. (2019). Pharmacogenetics and the management of chronic pain: a focus on opioids. Journal of the American Association of Nurse Practitioners, 31(6), 339-346.	Pharmacogenetics of opioids	Focus on the genetic influences on opioid management for chronic pain	Literature review	Genetic variants associated with opioid response identified	Personalized pain management using genetic information is promising	Long-term clinical trials on pharmacogenetic-guided therapy	Personalized opioid therapy based on genetic makeup
Gross, R., & Daniel, J. (2018). Pharmacogenomic testing for neuropsychiatric medications: An update for advanced practice nurses. The Mental Health Clinician, 8(6), 247-256.	Pharmacogenetics in nursing	Pharmacogenetic testing for neuropsychiatric meds	Review article	Importance of Pharmacogenetics in neuropsychiatric medication management	Advanced practice nurses should incorporate Pharmacogenetics testing	Ongoing research into Pharmacogenetics for broader applications	Integration of Pharmacogenetics testing in nursing protocols
Haga S. B., Mills, R, Moaddeb, J., Liu, Y., Voora, D. (2021). Delivery of Pharmacogenetic Testing with or without Medication Therapy Management in a Community Pharmacy Setting. Pharmgenomics Pers Med. 2021 Jul 9;14:785-796.	Delivery of pharmacogenetic testing	Assess the implementation of pharmacogenetic testing in community pharmacy	Community pharmacy implementation study	Positive outcomes in community pharmacy settings	Pharmacogenetic testing is feasible in community pharmacies	Examine broader applications in different settings	Pharmacogenetic services in community pharmacy practice
Hange, N., Poudel, S., Ozair, S., Paul, T., Nambakkam,	Neuropathic pain	Advances in	Literature review	Identified recent	New approach	Investigation into	Application of

M., Shrestha, R., Greye, F., Shah, S., Raj Adhikari, Y., Thapa, S., & Patel, P. (2022). Managing Chronic Neuropathic Pain: Recent Advances and New Challenges. Neurology Research International, 1–14. https://doi.org/10.1155/2022/8336561	managem ent.	managing chronic neuropath ic pain		advances and ongoing challenges	es needed for neuropath ic pain managem ent	long-term efficacy of new treatment	latest research in clinical practice
Hertz, D. L., Patel, J. H., Brignone, E., & McLeod, H. L. (2021). Impact of pharmacogenomics-guided pain management in patients with chronic pain: A single-center retrospective analysis. Pharmacogenomics and Personalized Medicine, pp. 14, 1–7. doi: 10.2147/PGPM.S293651 .	Pharmaco genomics in pain managem ent	Examine the impact of pharmaco genomics-guided pain managem ent	Retrospe ctive analysis	Improved pain managem ent with pharmaco genomic guidance	Pharmaco genomics can enhance pain managem ent strategies	Longitudi nal impact studies of pharmaco genomics on pain managem ent	integrate pharmaco genomics into pain managem ent protocols
Kalman, L. V., Agúndez, J. A., Appell, M. L., Black, J. L., Bell, G. C., Boukouvala, S., ... & Carr, D. F. (2021). Pharmacogenetic testing for opioid pain management: an evidence-based review of current recommendations. Mental Health Clinician, 11(2), 92-102.	Evidence-based pharmaco genetic testing	Review current opioid managem ent recommen dations with pharmaco genetic testing	Evidenc e-based review	Provided current recommen dations for opioid pain managem ent	Pharmaco genetic testing is recomme nded for certain patient populatio n	Research on pharmaco genetic testing outcomes	Use pharmaco genetic testing in opioid prescripti on practices
Kirsh, K. L., Ehlenberger, A., Huskey, A., Strickland, J., Egan City, K., & Passik, S. D. (2020). Retrospective analysis of pharmacogenetic testing to determine ultra-metabolizers and optimize pain management. Journal of Pain Research, 13, 655-661.	Pharmaco genetics of ultra-metaboliz ers	Determine the prevalenc e and impact of ultra-metaboliz ers on pain managem ent	Retrospe ctive analysis	Identificat ion of ultra-metaboliz ers to optimize pain managem ent	Tailored pain managem ent strategies for ultra-metaboliz ers are effective	Research into the genetic basis of ultra-metabolis m	Screen for ultra-metabolis m in pain managem ent settings
Kusic, D., Heil, J., Zajic, S., Brangan, A., Dairo, O., Smith, G., Morales-Scheihing, D., Buono, R. J., Ferraro, T. N., Haroz, R., Salzman, M., Baston, K., Bodofsky, E., Sabia, M., Resch, A., & Scheinfeldt, L. B. (2022). Patient Perceptions and Potential Utility of Pharmacogenetic Testing in Chronic Pain Management and Opioid Use	Patient perceptio ns on pharmaco genetic testing	Evaluate the utility of pharmaco genetic testing from the patient's perspectiv e	Survey study	Patients perceive pharmaco genetic testing positively	Patient education can improve the utility of pharmaco genetic testing	Explore patient education methods for pharmaco genetic testing	Patient-centered approach es in pharmaco genetic testing

Disorder in the Camden Opioid Research Initiative. Pharmaceutics, 14(9), N.PAG. https://doi.org/10.3390/pharmaceutics14091863							
Lippke, R. L. (2020). The value of pharmacogenomics in the management of chronic pain. Journal of Managed Care & Specialty Pharmacy, 26(6), 707-714.	Pharmacogenomics in chronic pain management	Explore the value of pharmacogenomics in chronic pain	Opinion piece	Advocates for pharmacogenomic approaches	Pharmacogenomics offers value in chronic pain management	Empirical studies validating the opinion	Incorporate pharmacogenomic insights into pain management strategies
Mackay, M., Fritchie, K., & Phillips, K. A. (2021). A Review of the Clinical Utility of Pharmacogenetic Testing in Pain Management. Pain Medicine (Malden, Mass.), 22(4), 771–782.	Clinical utility of pharmacogenetic testing	Review the clinical utility of pharmacogenetic testing in pain management	Systematic review	Evidence supports the clinical utility of pharmacogenetic testing	Pharmacogenetic testing can aid pain management decisions	Studies on implementation in clinical practice	Apply pharmacogenetic testing in clinical decision-making
Nerenz, R. D., & Tsongalis, G. J. (2018). Pharmacogenetics of Opioid Use and Implications for Pain Management. Journal of Applied Laboratory Medicine, 622–632. https://doi.org/10.1373/jalm.2017.023150	Pharmacogenetics and opioid use	Address the implications of pharmacogenetics for opioid pain management	Review article	Link between genetic factors and opioid response	Pharmacogenetics has significant implications for opioid use	Research into clinical guidelines for pharmacogenetic testing	Use pharmacogenetic information to guide opioid therapy
Robinson, L. A. (2022). Staff Education on the Benefits of Pharmacogenetic Testing for Chronic Pain Management : A Doctor of Nursing Practice Project [Doctoral project, University of Walden.	Staff education on pharmacogenetics	Examine the benefits of pharmacogenetic testing education among nursing staff	Educational intervention in a nursing practice	Improvement in staff knowledge and attitude towards pharmacogenetic testing	Education enhances understanding and application of pharmacogenetics in pain management	Assess long-term impacts of staff education on patient outcomes	Incorporate pharmacogenetic education into nursing training programs
Smith, J. et al. (2023). Pharmacogenomics in Chronic Pain Management: Recent Advances and Clinical Applications. *Journal of Pain Management, 20*(3), 123–135. Smith, D. M., Weitzel, K. W., Elsey, A. R., et al. Clinical outcomes and cost-effectiveness of pharmacogenomic-guided pain management.	Pharmacogenomics in pain management	Discuss recent advances and clinical applications of pharmacogenomics in chronic pain management	Review of literature	Highlighted the clinical applications and recent advances in the field	Pharmacogenomics is progressively shaping pain management practices	Explore the translational gap between research and clinical application	Update clinical guidelines to include pharmacogenomic advancement

Pharmacogenomics. 2019 Oct;20(15):1065–1077.							
Smith, D. M., et al. (2019)Smith, D. M., Weitzel, K. W., Elsey, A. R., Langaee, T. Y., Gong, Y., Wake, D. T., ... & Johnson, J. A. (2019). PGx-guided medication prescribing in a safety-net health care system. *Journal of the American Medical Informatics Association, 26(6),* 443–451.	Clinical outcomes of pharmaco genomic-guided pain managem ent	Evaluate the cost-effectiven ess of pharmaco genomic-guided pain managem ent	Cost-effective ness analysis	Pharmaco genomic-guided managem ent is cost-effective in certain settings	Incorpora ting pharmaco genomics can be cost-effective and improve clinical outcomes	Further research into economic impacts across diverse healthcar e settings	Economic evaluatio ns of pharmaco genomic testing in pain managem ent
Yee, M., Hess, K. M., Matuszewski, K. A., et al. Pharmacogenomic considerations for opioids in pain management. Mayo Clin Proc. 2018 Sep;93(9):1265-1282. doi 10.1016/j.mayocp.2018.05.025. PMID: 30190195.	Pharmaco genomic considera tions for opioid therapy	Consider the pharmaco genomic factors affecting opioid pain managem ent	Literatur e review and expert opinion	Identificat ion of genetic variants affecting opioid metabolis m and response	Pharmaco genomics can optimize opioid therapy and minimize adverse effects	More research needed on genetic factors affecting opioid efficacy and safety	Use pharmaco genomic testing to personali ze opioid therapy

Appendix B: Demographics

1. What is your current age?
    a. 25-35 years of age
    b. 36-50 years of age

c. 51-65 years of age

d. 66 years of age or older

2. What is your gender?

a. Male

b. Female

c. Prefer not to answer

3. What ethnicity do you identify with (Select all that apply)?

a. Black/African

b. Hispanic/Latino

c. Caucasian

d. Native American

e. Asian

f. Prefer not to answer

4. How many years in practice have you provided patient care in the Primary Care setting?

a. 0-5 years

b. 6-10 years

c. 11-15 years

d. 16-20 years

e. 21 years of more

5. What is your formal educational pathway as a Provider?

    a. Medical Doctor (MD)

    b. Doctor of Osteopathy (OD)

    c. Physician Assistant (PA)

    d. Nurse Practitioner (NP)

    e. Pharmacist (RPh)

    f. Psychologist (Psy.D.)

    g. Other

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Appendix C: Pharmacogenetic Testing Pretest/Posttest Questionnaire with Answer Key

1. How can Pharmacogenetic (PGx) testing be helpful in the primary care setting?

A) The drug variation of a person regarding medication changes

B) Identifying an individual's genetic variation regarding metabolic response to medications

C) Finding the drug response from the foods eaten

D) Teaching how medications help treat different disease processes

Answer: B

2. Does a patient's metabolic rate (slow metabolizer, normal metabolizer, or ultra-metabolizer) affect medication prescribing choices, duration, or dosage when deciding prescriptions in current prescribing practice?

A) Yes

B) NO

C) Not sure

Answer: A

3. Does PGx testing help identify a person's genotype (AA, AG, and GG) and metabolic profile pathways playing an essential role in medications' ability to work effectively or drug's bioavailability in the chronic pain patient?

A) Yes

B) No

C) Not sure

Answer: A

4. Will PGx testing identify potential risks of adverse drug events or potential drugs competing for binding sites?

A) Yes

B) No

C) Not sure

Answer: A

5. When counseling a patient about their pharmacogenetic (PGx) test results the following statement is most acceptable to use:

A) Your DNA is mutated

B) Your DNA is abnormal

C) You have a genetic variation or polymorphism

D) Both A and C

Answer: C

6. Does pharmacogenetic (PGx) testing encompass pharmacoeconomics regarding a patient medication cost savings?

A) True

B) False

Answer: A

7. Pharmacogenetic (PGx) testing can help improve pharmacotherapy by identifying patients:

A) At an increased risk of having no response when prescribed conventional drug therapy

B) At an increased risk of experiencing drug-induced toxicities when prescribed conventional drug therapy

C) Both A and B

D) None of the above

Answer: C

8. What are the four main Pharmacokenetic process steps?

A) Absorption, dissemination, mechanism, excretion

B) Adaptation, distribution, medical, exclusion

C) Absorption, distribution, metabolism, excretion

D) Alignment, digestion, muscle, execution

Answer: C

9. After learning the benefits of pharmacogenetic (PGx) testing as an individualized approach toward treating chronic pain patient, would you use this tool in your patient care?

A) Very likely

B) Likely

C) Neither nor unlikely

D) Unlikely

E) Very unlikely

Answer: A

10. What is the purpose of using Pharmacogenetic (PGx) testing?

A) To evaluate and identify a patient's sex, race, and age

B) To find additional uses of a medication regarding off-label uses

C) To evaluate and identify a patient's potential response to a medication's therapy

D) To evaluate the heritage of where the patient originated from

Answer: C

11. Post-test Additional Comments or questions:

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Appendix D: Development of the Educational Project

EDUCATIONAL IMPLEMENTATION:
Educating Providers on The Use of Pharmacogenetics (PGx) Testing in Pain Management

INITIAL PLANNING:

- Educating providers on use of Pharmacogenetics (PGx) testing in pain management
- **EDUCATIONAL IMPLEMENTATION**

Capstone chair: Dr. Fink
2nd committee member: Dr. Schweickert

PROBLEM STATEMENT

- **The General problem**
- Is the Lack of knowledge of PGx testing in local primary care facility
- **Specific problem to the project is that:**
- PCPs lack access to PGx testing despite evidence supporting its benefits in treating chronic pain
- Also, over-prescription of medication can lead to adverse reactions, addiction, and overdose

PRACTICE FOCUS QUESTION

- **The project questions are:**
- Will educating clinicians on PGx testing increase their knowledge in understanding the importance of PGx testing, as evidenced by pre/post survey?
- Will the literature support an education project on PGx testing in chronic pain treatment in a primary care clinic?

CONCEPTUAL FRAMEWORK: THE ADDIE MODEL

- **Framework:** The ADDIE model, is an evidence-based educational model that is widely used by instructional designers and training producers. It involves five processes, namely analysis, design, development, implementation, and evaluation.
- **Name of theory:** Albert Bandura's Self-Efficacy Theory
- **Theory or framework date developed and author:** In 1977, Albert Bandura developed his social-cognitive and self-efficacy theories
- **Brief summary of theory or framework and key tenets:**
- Albert Bandura's Self-Efficacy Theory suggests that an individual's belief in their ability to succeed in a particular task, known as self-efficacy, is essential for motivation, performance, and decision-making. The theory emphasizes the

importance of self-efficacy and result expectancies for initiating and maintaining activity, and describes the factors that influence self-efficacy expectations.

▶ **Relationship of project to this theory or framework:**

▶ This DNP project aims to increase healthcare providers' knowledge of pharmacogenetic (PGx) testing in pain management, which may improve their self-efficacy and confidence in prescribing medication. By providing education on the benefits and application of PGx testing, healthcare providers can feel more empowered to make informed decisions and tailor medication choices to individual patient needs, ultimately improving patient outcomes.

. | |Review of Scholarly | | Evidence on the Use of | |

Pharmacogenetics Testing in | | Chronic Pain Management

| | PROVIDENCE SEY, DNP STUDENT, MSN, BSN RN | |

EDUCATING PROVIDERS ON THE USE OF PHARMACOGENETICS (PGx) TESTING IN PAIN MANAGEMENT

- Explore the Power of Pharmacogenetic (PGx) Testing

- Evidence-Based Approach to Chronic Pain Management

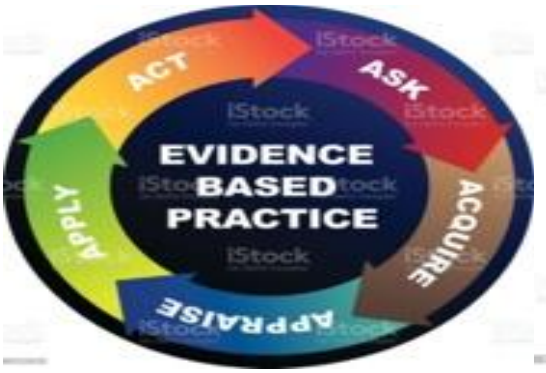
The Gap in Practice: Is the need for more knowledge and utilization of PGx testing among providers in outpatient and primary care settings

SIGNIFICANCE TO NURSING PRACTICE

- **This will improve individualized treatment options, reduce risk of adverse reactions, assist in managing Patients with chronic pain and opioids use disorder**
- Discover the Benefits of PGx Testing
- Importance of Evidence-Based Practice

SIGNIFICANCE TO SOCIAL CHANGE

- **This will help reduce opioid epidemic and improve pain management**



Appendix E: Johns Hopkins Nursing Evidence-Based Practice Appraisal Tool

John Hopkins Nursing Evidence-Based Practice

Non-Research Evidence Appraisal Tool

Evidence Level & Quality: _____

Article Title:		Number:
Author(s):		Publication Date:
Journal:		
Does this evidence address the EBP question?	☐ Yes	☐ No Do not proceed with appraisal of this evidence
Clinical Practice Guidelines: Systematically developed recommendations from nationally recognized experts based on research evidence or expert consensus		

panel. **LEVEL IV** **Consensus or Position Statement:** Systematically developed recommendations based on research and nationally recognized expert opinion that guides members of a professional organization in decision-making for an issue of concern. **LEVEL IV**		
• Are the types of evidence included identified?	☐ Yes	☐ No
• Were appropriate stakeholders involved in the development of recommendations?	☐ Yes	☐ No
• Are groups to which recommendations apply and do not apply clearly stated?	☐ Yes	☐ No
• Have potential biases been eliminated?	☐ Yes	☐ No
• Were recommendations valid (reproducible search, expert consensus, independent review, current, and level of supporting evidence identified for each recommendation)?	☐ Yes	☐ No
• Were the recommendations supported by evidence?	☐ Yes	☐ No
• Are recommendations clear?	☐ Yes	☐ No
Literature Review: Summary of published literature without systematic appraisal of evidence quality or strength. **LEVEL V**		
• Is subject matter to be reviewed clearly stated?	☐ Yes	☐ No
• Is relevant, up-to-date literature included in the review (most sources within last 5 years or classic)?	☐ Yes	☐ No
• Is there a meaningful analysis of the conclusions in the literature?	☐ Yes	☐ No

• Are gaps in the literature identified?	☐Yes	☐No
• Are recommendations made for future practice or study?	☐Yes	☐No
Expert Opinion: Opinion of one or more individuals based on clinical expertise. **LEVEL V**		
• Has the individual published or presented on the topic?	☐Yes	☐No
• Is author's opinion based on scientific evidence?	☐Yes	☐No
• Is the author's opinion clearly stated?	☐Yes	☐No
• Are potential biases acknowledged?	☐Yes	☐No

Evidence Level & Quality: _____

Organizational Experience:

Quality Improvement: Cyclical method to examine organization-specific processes at the local level. **LEVEL V**

Financial Evaluation: Economic evaluation that applies analytic techniques to identify, measure, and compare the cost and outcomes of two or more alternative programs or interventions. **LEVEL V**

Program Evaluation: Systematic assessment of the processes and/or outcomes of a program and can involve both quantitative and qualitative methods. **LEVEL V**

Setting:	**Sample (composition/size):**	
• Was the aim of the project clearly stated? • Was the method described? • Were process or outcome measures identified? • Were results described? • Was interpretation clear and appropriate? • Are components of cost/benefit analysis described?	☐Yes ☐Yes ☐Yes ☐Yes ☐Yes ☐Yes	☐No ☐No ☐No ☐No ☐No ☐No
Case Report: In-depth look at a person, group, or other social unit. **LEVEL V**		
Is the purpose of the case report clearly stated? • Is the case report clearly presented? • Are the findings of the case report supported by relevant theory or research? • Are the recommendations clearly stated and linked to the findings?	☐Yes ☐Yes ☐Yes ☐Yes	☐No ☐No ☐No ☐No
Community Standard, Clinician Experience, or Consumer Preference **Community Standard:** Current practice for comparable settings in the community **LEVEL V** **Clinician Experience:** Knowledge gained through practice experience **LEVEL V** **Consumer Preference:** Knowledge gained through life experience **LEVEL V**		

Information Source(s):	Number of Sources:	
• Source of information has credible experience. • Opinions are clearly stated. • Identified practices are consistent.	☐Yes ☐Yes ☐Yes	☐No ☐No ☐No
Findings that help you answer the EBP question:		

QUALITY RATING FOR CLINICAL PRACTICE GUIDELINES, CONSENSUS OR POSITION STATEMENTS (LEVEL IV)

High quality: Material officially sponsored by a professional, public, private organization, or government agency; documentation of a systematic literature search strategy; consistent results with sufficient numbers of well-designed studies; criteria-based evaluation of overall scientific strength and quality of included studies and definitive conclusions; national expertise is clearly evident; developed or revised within the last 5 years.

Good quality: Material officially sponsored by a professional, public, private organization, or government agency; reasonably thorough and appropriate systematic literature search strategy; reasonably consistent results, sufficient numbers of well-designed studies; evaluation of strengths and limitations of included studies with fairly definitive conclusions; national expertise is clearly evident; developed or revised within the last 5 years.

Low quality or major flaws: Material not sponsored by an official organization or agency; undefined, poorly defined, or limited literature search strategy; no evaluation of strengths and limitations of included studies, insufficient evidence

with inconsistent results, conclusions cannot be drawn; not revised within the last 5 years.
QUALITY RATING FOR ORGANIZATIONAL EXPERIENCE (LEVEL V) **A** **High quality:** Clear aims and objectives; consistent results across multiple settings; formal quality improvement or financial evaluation methods used; definitive conclusions; consistent recommendations with thorough reference to scientific evidence **B** **Good quality:** Clear aims and objectives; formal quality improvement or financial evaluation methods used; consistent results in a single setting; reasonably consistent recommendations with some reference to scientific evidence **C** **Low quality or major flaws:** Unclear or missing aims and objectives; inconsistent results; poorly defined quality improvement/financial analysis method; recommendations cannot be made

QUALITY RATING FOR LITERATURE REVIEW, EXPERT OPINION, COMMUNITY STANDARD, CLINICIAN EXPERIENCE, CONSUMER PREFERENCE (LEVEL V)
A **High quality:** Expertise is clearly evident; draws definitive conclusions; provides scientific rationale; thought leader in the field
B **Good quality:** Expertise appears to be credible; draws fairly definitive conclusions; provides logical argument for opinions
C **Low quality or major flaws:** Expertise is not discernable or is dubious; conclusions cannot be drawn

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Appendix F: Evaluation of the Pharmacogenetic Testing Presentation by Content Experts

Presenter: Providence Sey

Walden University

Objective Statement:	**Were the objectives met**? **Not met**? Please circle.	**Comments**:
Participants will be able to describe uses for PGx testing in the primary care setting	Yes No	
Participants will gain understanding how PGx testing can be a tool in adverse drug related events	Yes No	

Participants will gain understanding the benefit of PGx testing as a personalized medicine	Yes No	
Participants be able to identify at least two positive attributes in the use of PGx testing in the chronic pain patient	Yes No	
Participants will gain understanding how PGx testing can identify potential drug antagonists	Yes No	
Participants will learn that PGx testing is a simple non-invasive test process	Yes No	
Additional Comments:		

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Appendix G: Summary Evaluation Results of the Staff Education Project by Content Experts

INSTRUCTIONS: Please check each item to see if the question is representative of the course objective and the correct answer is reflected in the course content.

Pre/post Test Item #

1. Not Relevant __ Somewhat Relevant__ Relevant __ Very Relevant__

Comments:

2. Not Relevant__ Somewhat Relevant__ Relevant __ Very Relevant__

Comments:

3. Not Relevant __ Somewhat Relevant__ Relevant __ Very Relevant__

Comments:

4. Not Relevant__ Somewhat Relevant__ Relevant__ Very Relevant__

Comments:

5. Not Relevant__ Somewhat Relevant__ Relevant__ Very Relevant__

Comments:

6. Not Relevant__ Somewhat Relevant __ Relevant __ Very Relevant__

Comments:

7. Not Relevant__ Somewhat Relevant __ Relevant __ Very Relevant__

Comments:

8. Not Relevant__ Somewhat Relevant __ Relevant___ Very Relevant__

Comments:

9. Not Relevant__ Somewhat Relevant __ Relevant __ Very Relevant__

Comments:

10. Not Relevant__ Somewhat Relevant __ Relevant __ Very Relevant__

Comments:

I. This project was a

a. Please describe the effectiveness (or not) of this project as related to communication, and desired outcomes etc.

Evaluator A	Evaluator B

b. How do you feel about your involvement as a content expert?

Evaluator A	Evaluator B

c. What aspects of the project would you like to see improved?

Evaluator A	Evaluator B

II. Pre/ posttest

a. Was the pre/ posttest relevant to the content

Evaluator A	Evaluator B

b. Share how you might have changed the project

Evaluator A	Evaluator B

III. The role of the student was to be the team leader.

a. As a team leader how did the student direct the team to meet the project goals?

Evaluator A	Evaluator B

IV. Please offer suggestions for improvement.

Evaluator A	Evaluator B

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Appendix H: Pharmacogenetic Testing Education Outline

I. Understanding Pharmacogenetic (PGx) Testing as a Tool in the Chronic Pain Patient
   a. Educational PowerPoint
   b. Introduction

II. Individualized Patient Metabolism
   a. Describe type of metabolizer
   b. Medication, Duration, or Dosage
   c. Genetic profile
   d. Genetic variability

III. Drug Bioavailability
   a. Genotype (AA, AG, and GG)
   b. Adverse drug events
   c. Theory pharmacogenetic (PGx) testing
   d. Pain management

IV. Chronic pain
   a. Variety of different types of pain
   b. Chronic pain examples

V. Pharmacogenetic (PGx) Testing process
   a. Steps include

VI. Pharmacogenetic (PGx) Testing
   a. Benefit of using PGx testing

VII. Personalized Medicine

a. Physiological factors

b. Environmental factors

c. Cytochrome P450

VIII. Drug Metabolism factors to take into consideration

a. Non-evasive test

b. Prescribing tool (Individualized)

c. Improved daily function

IX. Pharmacogenetic (PGx) testing benefits

a. Customized approach to pain management

b. Decrease medication waste

c. Self-efficacy

d. Metabolic profile tool

X. References

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Appendix I: Frequency Table

What is your current age?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	25-35 years of age	2	11.1	11.1	11.1
	36-50 years of age	4	38.9	38.9	50.0
	51-65 years of age	5	44.4	44.4	94.4
	66 years of age or older	1	5.6	5.6	100.0
	Total	12	100.0	100.0	

What is your gender?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	5	44.4	44.4	44.4
	Female	7	55.6	55.6	100.0
	Total	12	100.0	100.0	

What ethnicity do you identify with (Select all that apply)?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Black/African	1	5.6	5.6	5.6
	Hispanic/Latino	2	22.2	22.2	27.8
	Caucasian	8	66.7	66.7	94.4
	Asian	1	5.6	5.6	100.0
	Total	12	100.0	100.0	

How many years in practice have you provided patient care in the Primary Care setting?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-5 years	5	38.9	38.9	38.9
	6-10 years	1	11.1	11.1	50.0
	11-15 years	1	11.1	11.1	61.1
	16-20 years	2	16.7	16.7	77.8

	21 years of more	3	22.2	22.2	100.0
	Total	12	100.0	100.0	

What is your formal educational pathway as a Provider?

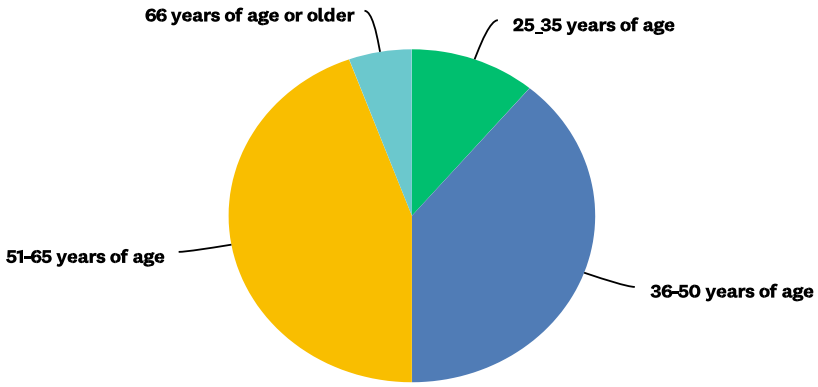
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Medical Doctor (MD)	1	11.1	11.1	11.1
	Other Physicians	3	27.8	27.8	38.9
	Other PCPs	6	38.9	38.9	77.8
	Other	2	22.2	22.2	100.0
	Total	12	100.0	100.0	

Appendix J: Data Questions and Findings from Survey Monkey Questionnaire

Demographics

Q1. What is your current age?

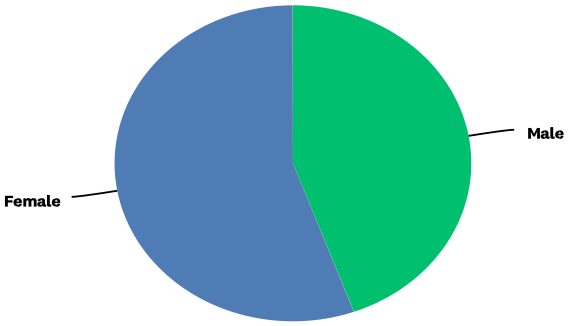
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
25-35 years of age	11.11%	2
36-50 years of age	38.89%	4
51-65 years of age	44.44%	5
66 years of age or older	5.56%	1
TOTAL		12

Q2. What is your gender?

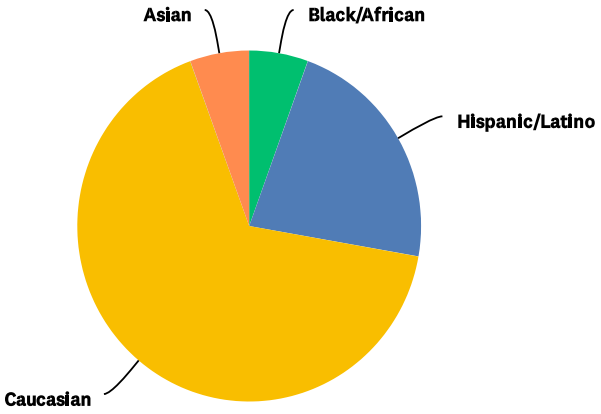
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
Male	44.44%	5
Female	55.56%	7
Prefer not to answer	0.00%	0
TOTAL		12

Q3. What ethnicity do you identify with (Select all that apply)?

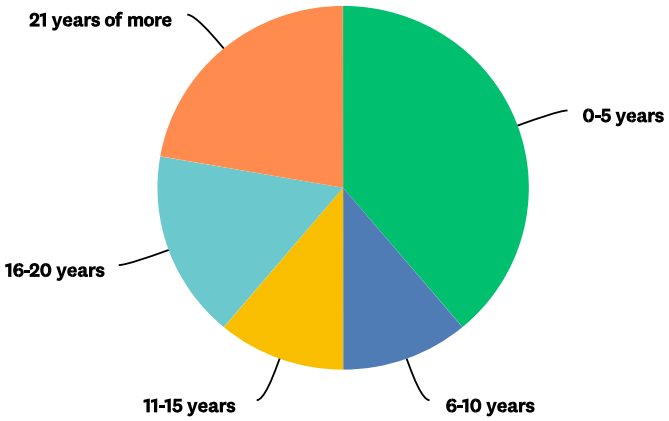
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
Black/African	5.56%	1
Hispanic/Latino	22.22%	4
Caucasian	66.67%	7
Native American	0.00%	0
Asian	5.56%	1
Prefer not to answer	0.00%	0
TOTAL		12

Q4. How many years in practice have you provided patient care in the Primary Care setting?

Answered: 12 Skipped: 0

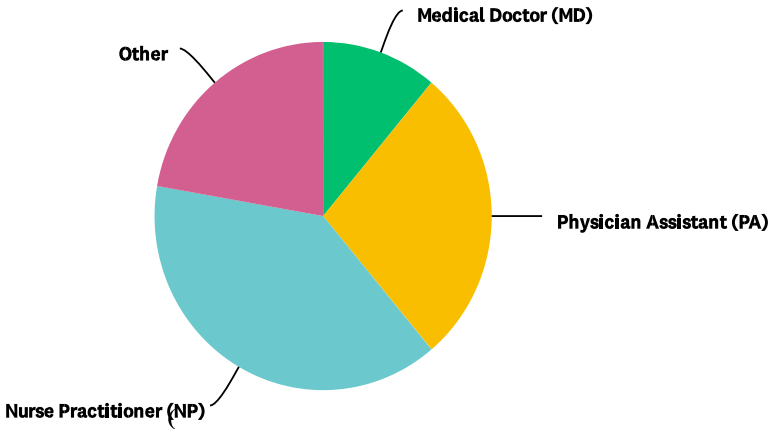


ANSWER CHOICES	RESPONSES	
0-5 years	38.89%	3
6-10 years	11.11%	2

11-15 years	11.11%	2
16-20 years	16.67%	3
21 years of more	22.22%	2
TOTAL		12

Q5. What is your formal educational pathway as a Provider?

Answered: 12 Skipped: 0



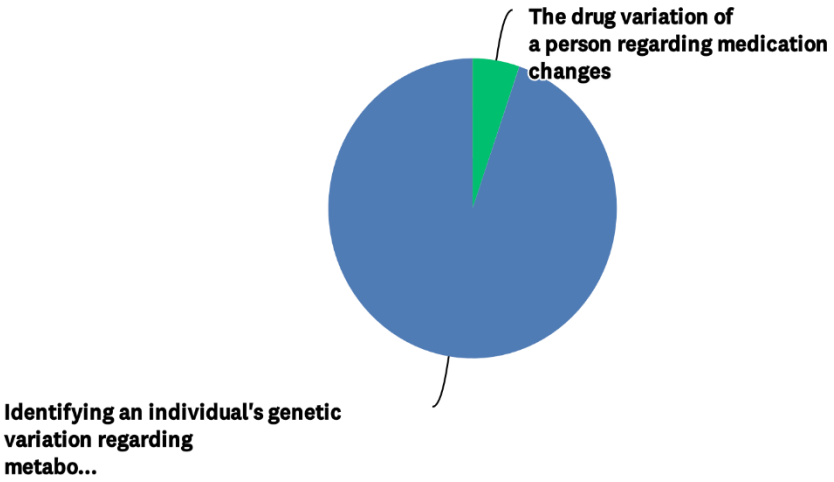
ANSWER CHOICES	RESPONSES	
Medical Doctor (MD)	11.11%	2
Doctor of Osteopathy (OD)	0.00%	0
Other Physicians	27.78%	3
PCPs	38.89%	5
Other PCPs	0.00%	0
Other PCPs	0.00%	0

Other	22.22%	2
TOTAL		12

Pre-test Questionnaire

Q1. How can Pharmacogenetic (PGx) testing be helpful in the primary care setting?

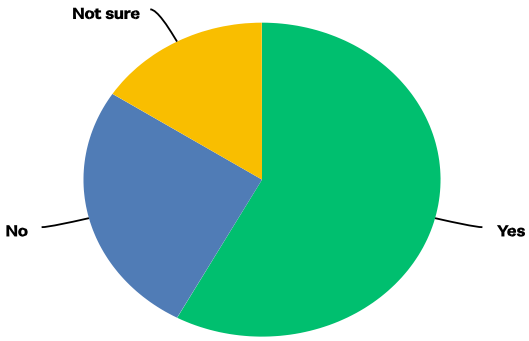
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
The drug variation of a person regarding medication changes	5.26%	1
Identifying an individual's genetic variation regarding metabolic response to medications	94.74%	11
Finding the drug response from the foods eaten	0.00%	0
Teaching how medications help treat different disease processes	0.00%	0
TOTAL		12

Q2. Does a patient's metabolic rate (slow metabolizer, normal metabolizer, or ultra-metabolizer) affect medication prescribing choices, duration, or dosage when deciding prescriptions in current prescribing practice?

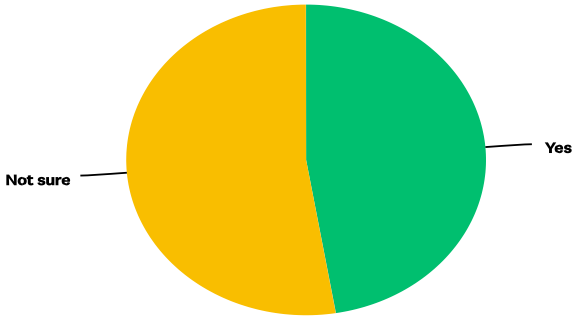
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	57.89%	7
No	26.32%	4
Not sure	15.79%	1
TOTAL		12

Q3. Does PGx testing help identify a person's genotype (AA, AG, and GG) and metabolic profile pathways playing an essential role in medications' ability to work effectively or drug's bioavailability in the chronic pain patient?

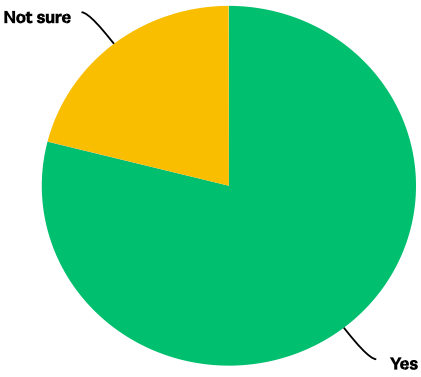
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	47.37%	6
No	0.00%	0
Not sure	52.63%	7
TOTAL		12

Q4. Will PGx testing identify potential risks of adverse drug events or potential drugs competing for binding sites?

Answered: 12 Skipped: 0

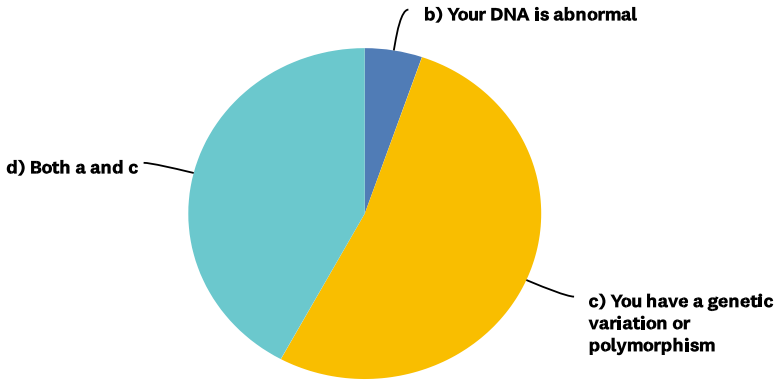


ANSWER CHOICES	RESPONSES	
Yes	78.95%	8

No	0.00%	0
Not sure	21.05%	4
TOTAL		12

Q5. When counseling a patient about their pharmacogenetic (PGx) test results the following statement is most acceptable to use:

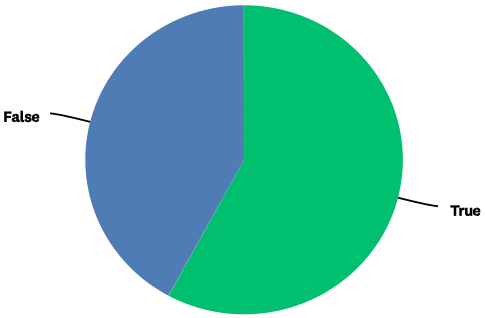
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
a) Your DNA is mutated	0.00%	0
b) Your DNA is abnormal	5.26%	1
c) You have a genetic variation or polymorphism	52.63%	8
d) Both a and c	42.11%	3
TOTAL		12

Q6. Does pharmacogenetic (PGx) testing encompass pharmacoeconomics regarding a patient medication cost savings?

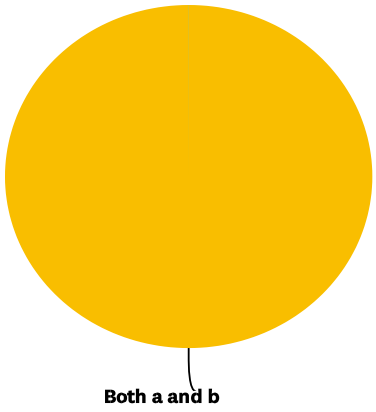
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
True	57.89%	7
False	42.11%	5
TOTAL		12

Q7. Pharmacogenetic (PGx) testing can help improve pharmacotherapy by identifying patients:

Answered: 12 Skipped: 0

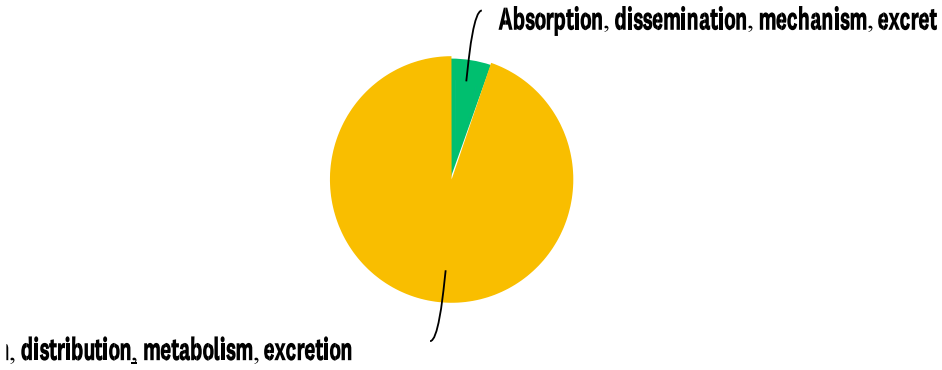


ANSWER CHOICES	RESPONSES	
At an increased risk of having no response when prescribed conventional drug therapy	0.00%	0

At an increased risk of experiencing drug-induced toxicities when prescribed conventional drug therapy	0.00%	0
Both a and b	100.00%	12
None of the above	0.00%	0
TOTAL		12

Q8. What are the four main Pharmacokenetic process steps?

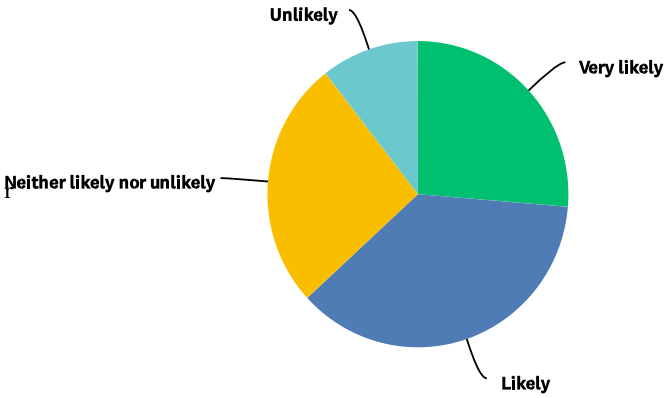
Answered: 19 Skipped: 0



ANSWER CHOICES	RESPONSES	
Absorption, dissemination, mechanism, excretion	5.26%	1
Adaptation, distribution, medical, exclusion	0.00%	0
Absorption, distribution, metabolism, excretion	94.74%	11
Alignment, digestion, muscle, execution	0.00%	0
TOTAL		12

Q9. After learning the benefits of pharmacogenetic (PGx) testing as an individualized approach towards treating chronic pain patient, would you use this tool in your patient care?

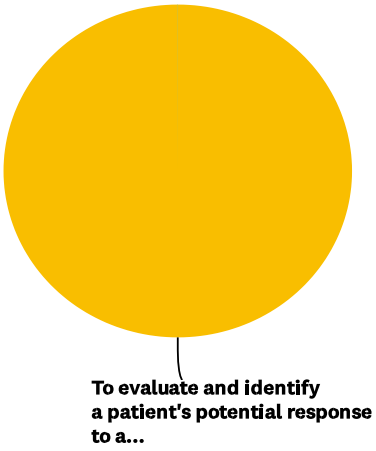
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
Very likely	26.32%	4
Likely	36.84%	5
Neither nor unlikely	26.32%	3
Unlikely	10.53%	1
Very unlikely	0.00%	0
TOTAL		12

Q10. What is the purpose of using Pharmacogenetic (PGx) testing?

Answered: 12 Skipped: 0

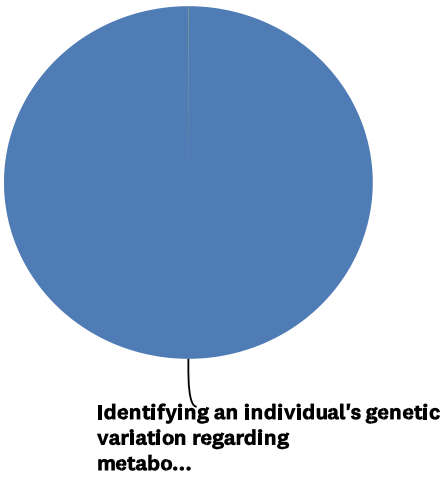


ANSWER CHOICES	RESPONSES	
To evaluate and identify a patient's sex, race, and age	0.00%	0
To find additional uses of a medication regarding off-label uses	0.00%	0
To evaluate and identify a patient's potential response to a medication's therapy	100.00%	12
To evaluate the heritage of where the patient originated from	0.00%	0
TOTAL		12

Post-test Questionnaire

Q.1 How can Pharmacogenetic (PGx) testing be helpful in the primary care setting?

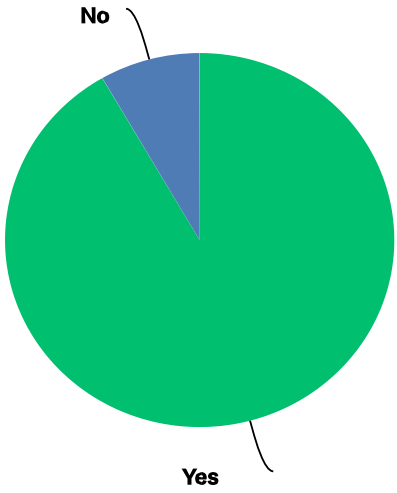
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
The drug variation of a person regarding medication changes	0.00%	0
Identifying an individual's genetic variation regarding metabolic response to medications	100.00%	12
Finding the drug response from the foods eaten	0.00%	0
Teaching how medications help treat different disease processes	0.00%	0
TOTAL		12

Q2. Does a patient's metabolic rate (slow metabolizer, normal metabolizer, or ultra-metabolizer) affect medication prescribing choices, duration, or dosage when deciding prescriptions in current prescribing practice?

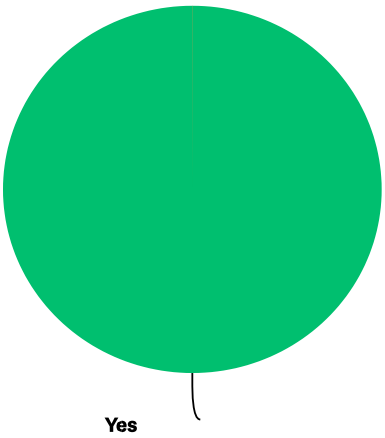
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	91.67%	11
No	8.33%	1
Not sure	0.00%	0
TOTAL		12

Q3. Does PGx testing help identify a person's genotype (AA, AG, and GG) and metabolic profile pathways playing an essential role in medications' ability to work effectively or drug's bioavailability in the chronic pain patient?

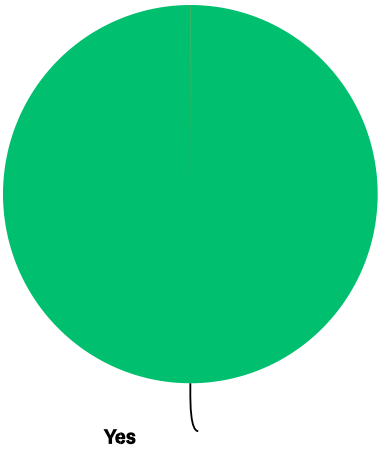
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	100.00%	12
No	0.00%	0
Not sure	0.00%	0
TOTAL		12

Q4. Will PGx testing identify potential risks of adverse drug events or potential drugs competing for binding sites?

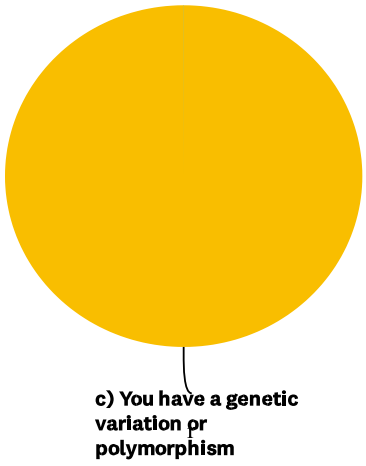
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	100.00%	12
No	0.00%	0
Not sure	0.00%	0
TOTAL		12

Q5. When counseling a patient about their pharmacogenetic (PGx) test results the following statement is most acceptable to use:

Answered: 12 Skipped: 0

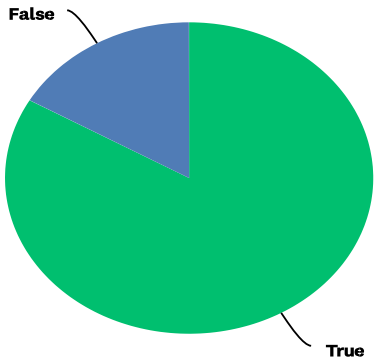


ANSWER CHOICES	RESPONSES	
a) Your DNA is mutated	0.00%	0
b) Your DNA is abnormal	0.00%	0
c) You have a genetic variation or polymorphism	100.00%	12
d) Both a and c	0.00%	0

TOTAL	12

Q6. Does pharmacogenetic (PGx) testing encompass pharmacoeconomics regarding a patient medication cost savings?

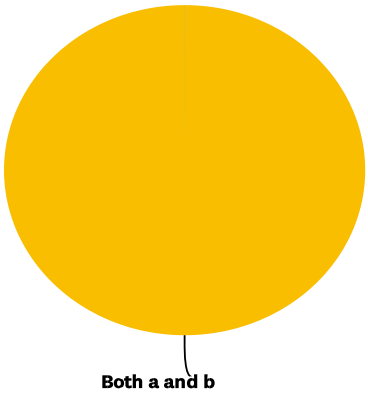
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
True	83.33%	10
False	16.67%	2
TOTAL		12

Q7. Pharmacogenetic (PGx) testing can help improve pharmacotherapy by identifying patients:

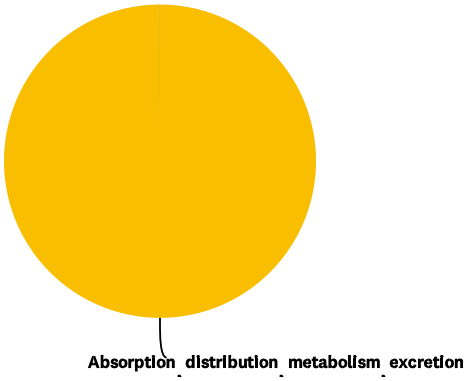
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
At an increased risk of having no response when prescribed conventional drug therapy	0.00%	0
At an increased risk of experiencing drug-induced toxicities when prescribed conventional drug therapy	0.00%	0
Both a and b	100.00%	12
None of the above	0.00%	0
TOTAL		12

Q8. What are the four main Pharmacokenetic process steps?

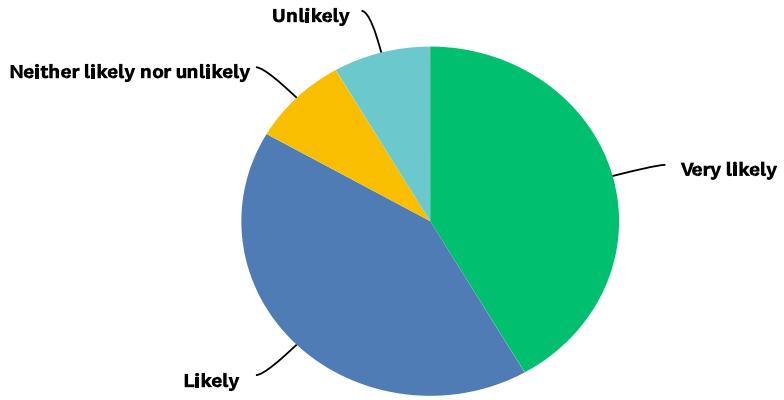
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
Absorption, dissemination, mechanism, excretion	0.00%	0
Adaptation, distribution, medical, exclusion	0.00%	0
Absorption, distribution, metabolism, excretion	100.00%	12
Alignment, digestion, muscle, execution	0.00%	0
TOTAL		12

Q9. After learning the benefits of pharmacogenetic (PGx) testing as an individualized approach towards treating chronic pain patient, would you use this tool in your patient care?

Answered: 12 Skipped: 0

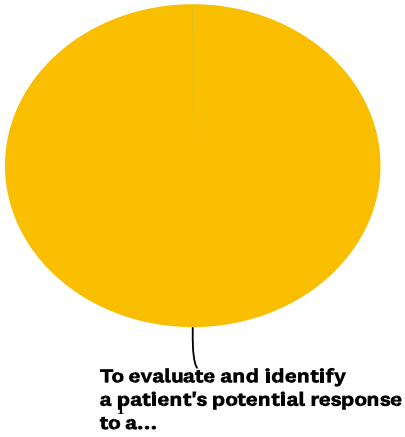


ANSWER CHOICES	RESPONSES	
Very likely	41.67%	5
Likely	41.67%	5

Neither likely nor unlikely	8.33%	1
Unlikely	8.33%	1
Very unlikely	0.00%	0
TOTAL		12

Q10. What is the purpose of using Pharmacogenetic (PGx) testing?

Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
To evaluate and identify a patient's sex, race, and age	0.00%	0
To find additional uses of a medication regarding off-label uses	0.00%	0
To evaluate and identify a patient's potential response to a medication's therapy	100.00%	12
To evaluate the heritage of where the patient originated from	0.00%	0
TOTAL		12

Robinson, L. A. (2022).

Appendix K: PowerPoint / Presentation

EDUCATING PROVIDERS ON THE USE OF PHARMACOGENETICS (PGx) TESTING IN PAIN MANAGEMENT

- Explore the Power of Pharmacogenetic (PGx) Testing
- Evidence-Based Approach to Chronic Pain Management

The Gap in Practice: Is the need for more knowledge and utilization of PGx testing among providers in outpatient and primary care settings

Pharmacogenetics Testing in | | Chronic Pain Management

SIGNIFICANCE TO SOCIAL CHANGE

- **This will help reduce opioid epidemic and improve pain management**

Review of Scholarly Evidence

- Key findings from the literature, such as the potential of PGx testing to reduce adverse drug events, improve medication management, and individualize treatment choices based on a patient's genetic profile
- Key Findings from Scholarly Articles:

Reduction in Adverse Drug Events (ADEs)

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Improved Medication Management

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Personalized Treatment Choices Based on Genetic Profile

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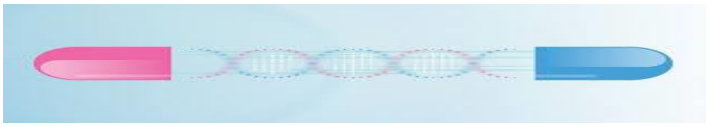
NOTABLE STUDIES:

Lee et al. (2021).

Goodin et al. (2019)

Precision Medicine



Kalman et al. (2021)

CONCLUSION AND FUTURE DIRECTION

- **Conclusion: Educating healthcare providers on pharmacogenetics testing in chronic pain management is crucial for improving personalized treatment approaches and optimizing patient outcomes.**

- **Future Directions: Further research is needed to develop evidence-based educational programs, assess the implementation of pharmacogenetics testing in clinical practice, and evaluate the long-term impact on patient satisfaction, treatment efficacy, and healthcare utilization.**

- **PGx Testing: A Promising Approach to Chronic Pain Management**
- **Future Directions:**
  - **Cost-Effectiveness Evaluation**
  - **Impact on Patient Outcomes**

- **Join the Revolution in Chronic Pain Management**

- **Stay Informed, Improve Patient Care**

SOURCES OF EVIDENCE

- **Review of scholarly evidence:**
- Key findings from the literature, such as the potential of PGx testing to reduce adverse drug events, improve medication management, and individualize treatment choices based on a patient's genetic profile
- Examples of studies reviewed, such as Lee et al. (2021), Goodin et al. (2019), and Kalman et al. (2021)
    - **Search engines:** List of search engines used to obtain scholarly evidence
- Examples: CINAHL, MEDLINE, academic journals, pharmacogenetics (PGx) testing laboratories
    - **Keywords**
- List of keywords used in the search process: Examples: Chronic pain, pharmacogenetics, genotyping, medication management, adverse drug events (ADEs), CYP2D6 enzyme, personalized medicine

Grading of evidence: Grading of evidence is used to evaluate the quality of the literature reviewed

- Examples of grading systems, such as GRADE or Oxford Centre for Evidence-Based Medicine
    - **Analysis and synthesis:** Results from the pretest and posttest findings to evaluate practitioners' understanding of the benefits of PGx testing in treating chronic pain patients

- The study's findings will provide insight into how to effectively integrate PGx testing into future practice to improve chronic pain management in patients

DNP EDUCATIONAL IMPLEMENTATION CLOSING REMARKS:

- **Thank you Providers & Staff**
- **Dr. Fink & Dr. Schweickert**
- **This concludes my DNP Educational Implementation Presentation.**
- **I would now like to invite your questions.**

- **References: Already submitted**

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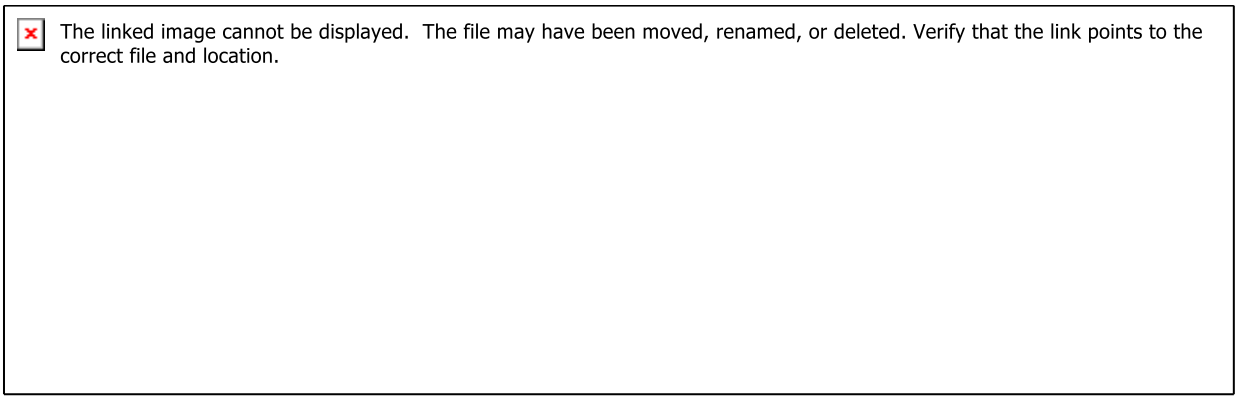
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