



2019

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# Managing Anxiety with Pharmacogenomic Testing

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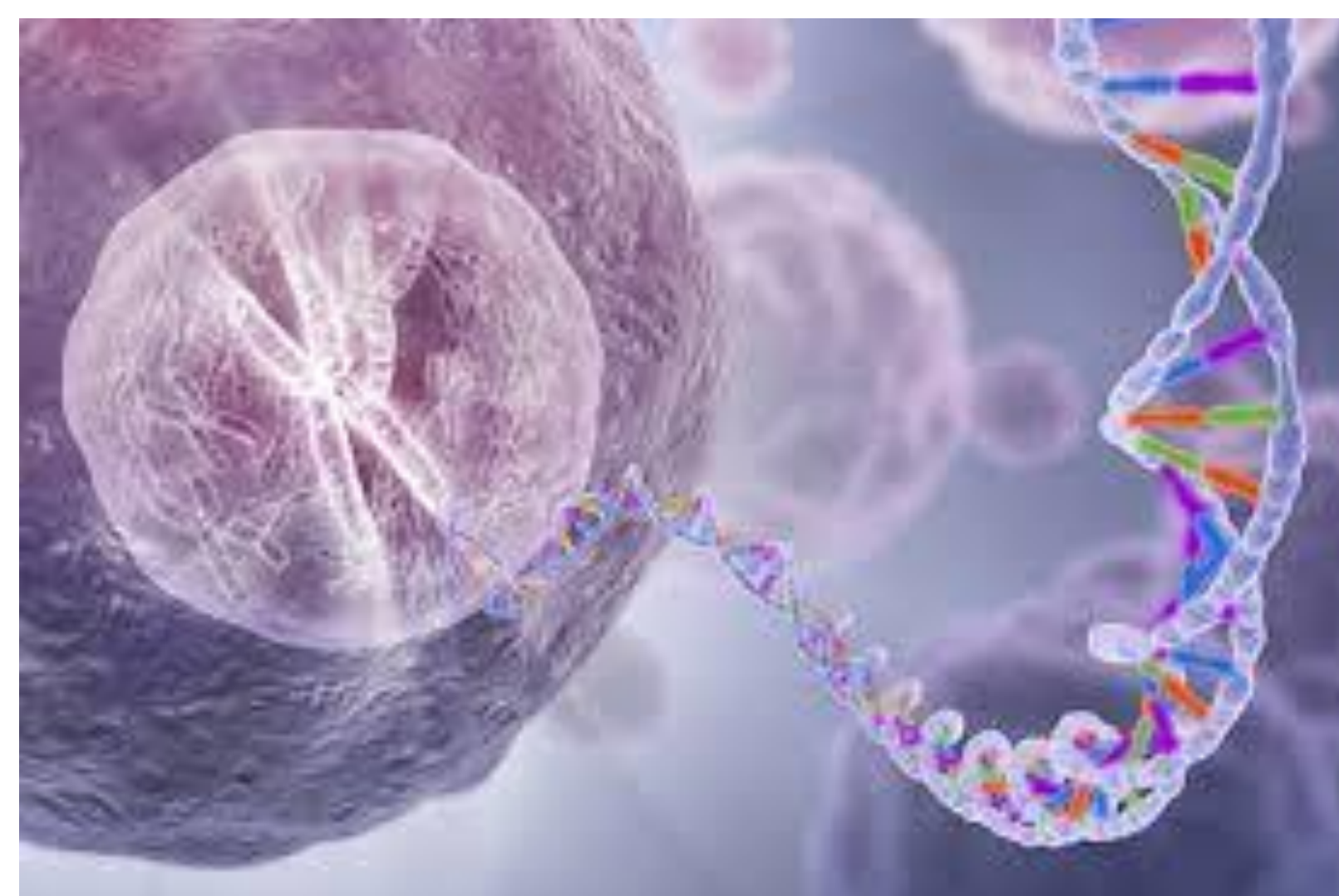
## Abstract

Anxiety affects approximately three to seven percent of the United States population, and nearly 50% of the diagnosed patients fail to respond to first-line treatment regimens (Boland, Duffy, & Meyer 2018). Traditional first-line treatments include medication therapy, cognitive behavioral therapy (CBT), or the combination of both. With such a high initial failure rate, recent studies indicate promising results in managing anxiety with pharmacogenomic testing. Pharmacogenomic testing is allowing providers to prescribe medication based on individual genetic makeup, focusing on how each patient metabolizes certain medications. The purpose of this literature review was to determine if first-line methods or pharmacogenomic testing provide patients with more prompt symptom relief. Through a review of several electronic databases and articles, pharmacogenomic testing is yielding promising results in symptom relief, decreasing healthcare costs, and increasing healthcare efficacy. Not only is pharmacogenomic testing promising for anxiety management, it also gives insight to several other medication classes. With this information, pharmacogenomic testing may soon be a screening tool in future medicine.

Keywords: anxiety, pharmacogenomic testing, anxiety management, first-line anxiety treatment, pharmacogenetic testing

## Introduction

According to DynaMed Plus (2018), “Anxiety is characterized by chronic, unfocused, excessive worry and stress associated with clinically significant distress and functional impairment, often accompanied by insomnia, restlessness, muscle tension, and concentration problems.” Anxiety affects approximately three to seven percent of the United States population, and nearly 50% of those affected fail to respond to first-line treatment regimens, such as medication and/or therapy (Boland et al., 2018). Failed treatment can be influenced by environment exposures, nutrition, co-morbidities, severity of disease, and medication interactions (Lee, 2018).



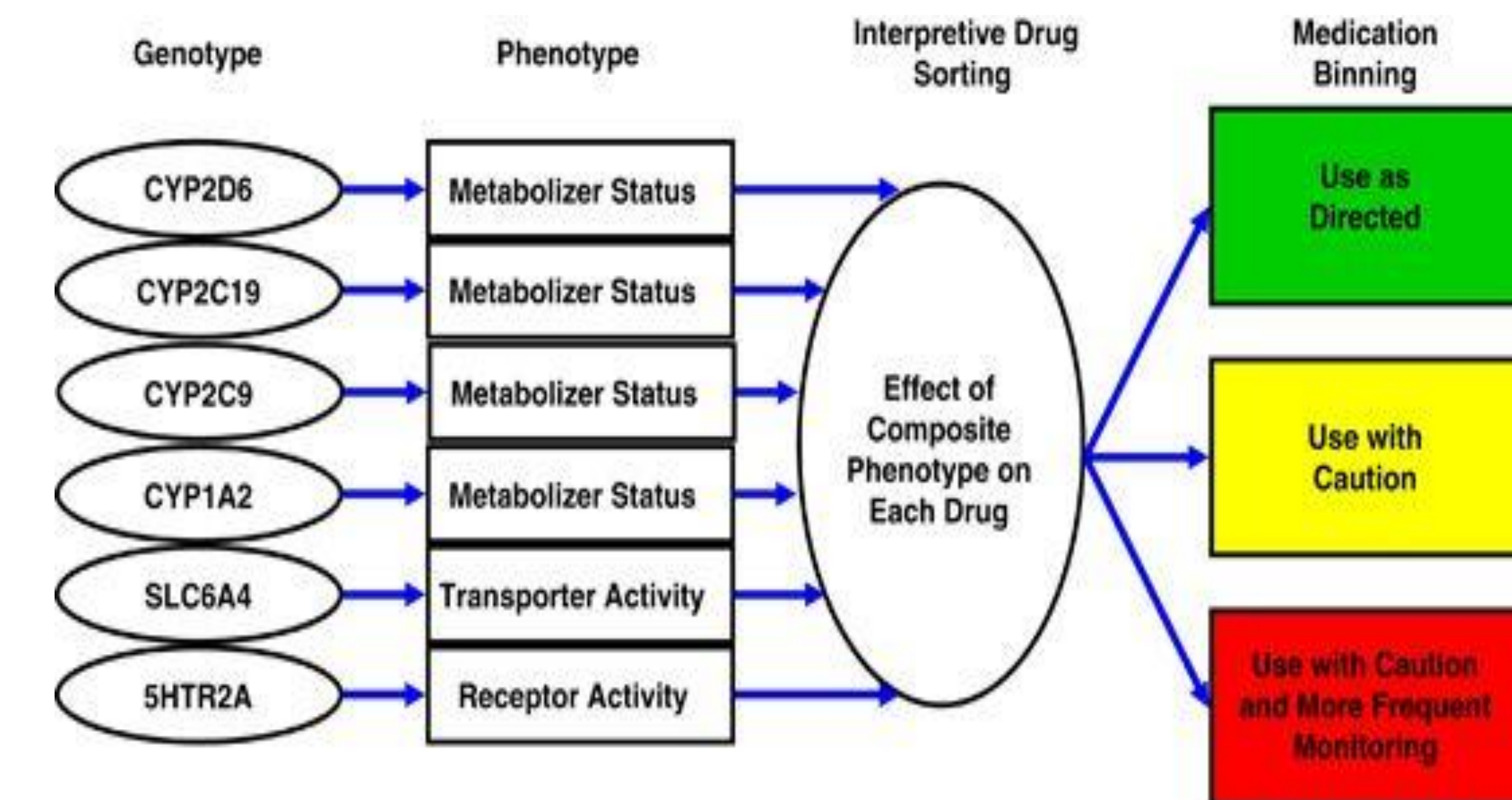
<http://mayoresearch.mayo.edu/center-for-individualized-medicine/drug-gene-testing.asp>

## Statement of the Problem

Underdiagnosis of anxiety is quite common, with an average patient seeing 10 healthcare professionals before a definitive diagnosis is made, which can lead to increased health care costs in comparison to other disorders (Lee, 2018). According to Genome Wide Association Studies (GWAS), genetic variation alone accounts for 42% of varied first-line therapy response (Boland et al., 2018). Due to a person’s genetic makeup, patients are not being prescribed the most effective medication given their deoxyribonucleic acid (DNA). With such a high initial failure rate, pharmacogenomic testing has become an area of research. With this research, it is thought patients can experience symptom relief upon initial treatment, prevent future relapse, reduce healthcare costs, and improve overall healthcare efficacy.

## Research Question

- In treating anxiety, do those who elect to have pharmacogenomic testing versus those who are treated based on first-line treatments have better symptom management?
- In managing anxiety, would patients who respond to pharmacogenetic testing have decreased healthcare costs and improve overall healthcare efficacy in comparison to those who trial several medications?



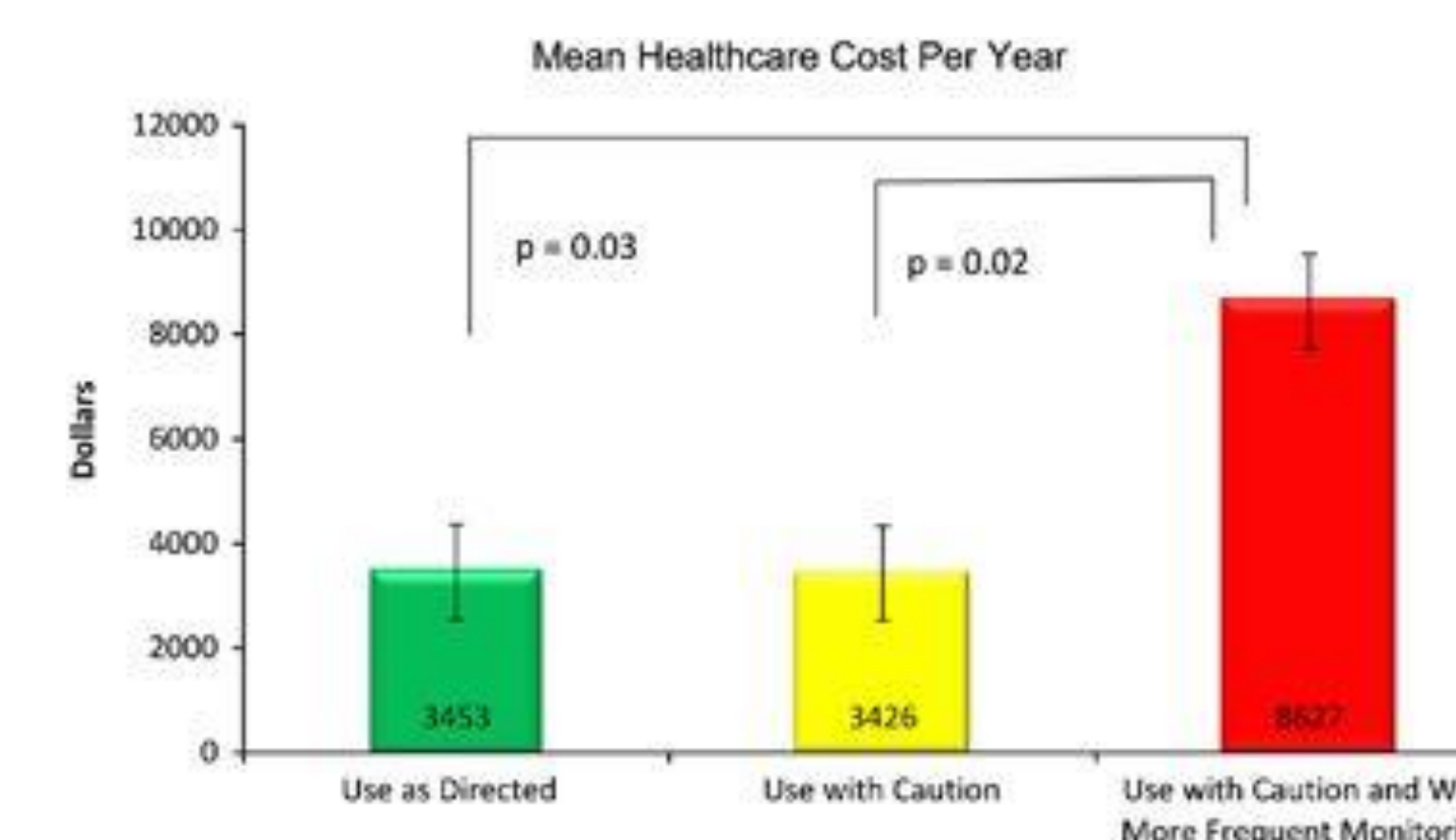
Winner, J., Allen, J. D., Altar, C. A., & Spahic-Mihajlovic, A. (2013). Psychiatric pharmacogenomics predicts health resource utilization of outpatients with anxiety and depression. *Translation Psychiatry*, 3(3), 242. <https://doi.org/10.1038/tp.2013.2>

## Literature Review

- **First-line Treatment for Anxiety**
  - SSRI medication, CBT, or the combination of both
  - Many individuals decline CBT
  - 50% of individuals fail first-line treatment methods
- Individual responses vary to treatment making management difficult
- **Pharmacogenomic Testing in Managing Anxiety**
  - Of the 50% of individuals who fail first-line treatment methods, 50% of those fail due to genetic variation.
  - Testing allows providers to prescribe medications based on each individual DNA
  - Research is focusing on CYP450 gene which is responsible for oxidation of antidepressant medications.
  - Those with SLC6A4 and MTHFR genotype benefit from pharmacogenomic testing, by eliminating drugs that will not produce effective metabolism.
  - CYP2D6 is commonly found in Caucasians vs African Americans leading to different medication regimens
- **Cost Comparison in Pharmacogenomic Testing Versus First-line Methods**
  - A trial with IDgenetix® showed a \$535 cost saving over a three-year period in those who elected to have pharmacogenetic testing.
  - Brown et al., (2017) concluded that those who received pharmacogenomic testing saved \$3,988 within that testing year
    - This was an extension of a trial which concluded \$1,036 in yearly medical costs
  - Winner et al., (2017) trial concluded pharmacogenetic testing can lead to decreased direct and indirect healthcare utilization and cost
    - Those prescribed medication marked “use with caution with more frequent monitoring” had more general medical visits, along with more sick days, and more disability claims

## Discussion

- **In treating anxiety, do those who elect to have pharmacogenomic testing versus those who are treated based on first-line treatments have better symptom management?**
  - Combination therapy provided no additional benefit
    - Patients often refuse
  - Only 50.6% of patients remain on first-line provider preference after pharmacogenetic testing was completed (Boland et al., 2018).
  - Genetic variation plays a major role in medication metabolism
    - Those with SLC6A4 and MTHFR genotype do not metabolize traditional first-line SSRI and SNRI medications (Boland et al., 2018). Therefore, would fail many first-line medication trials.
  - Bradley et al. (2018), also showed promising statistical benefits of pharmacogenetic testing.
    - Patients classified to have moderate to severe anxiety showed a reduction in anxiety symptoms when they were prescribed medications based off NeuroIDgenetix® guided treatment.
    - Providers made less changes to medications to those who had the genetic testing done in comparison to those who were prescribed provider preference medications (Bradley et al., 2018).
- **In managing anxiety, would patients who respond to pharmacogenomic testing have decreased healthcare costs and improve overall healthcare efficacy in comparison to those who trial several medications?**
  - In comparing healthcare costs of first-line methods versus results from pharmacogenetic testing, studies indicate decreased health care costs for those who receive pharmacogenetic testing.
  - Those who were part of the CALM trial saw an increase in healthcare costs of \$245 over an 18-month period (Joesch et al., 2013). These patients received medications based off first-line medication treatment and were offered CBT. While those who had IDgenetix® pharmacogenetic testing saw a decrease of \$535 in healthcare costs over a three-year period (Najafzadeh et al., 2017).
  - Winner et al. (2013) also supports decreased healthcare costs for those who are treated based on pharmacogenetic testing.
    - Those who received medication labeled “use with caution and frequent monitoring” saw a significant increase in treatment costs, more general medical visits, more psychiatric visits, increase in disability claims, decreased productivity, and missed work (Winner et al., 2013).
    - Those who were treated with “use with caution” or “use as directed” medications equally both saw decreased healthcare costs and increased healthcare efficacy with decreased medical and psychiatric visits. (Winner et al., 2013).



Winner, J., Allen, J. D., Altar, C. A., & Spahic-Mihajlovic, A. (2013). Psychiatric pharmacogenomics predicts health resource utilization of outpatients with anxiety and depression. *Translation Psychiatry*, 3(3), 242. <https://doi.org/10.1038/tp.2013.2>

## Applicability to Clinical Practice

Understanding how genetic testing works and implicating those results into practice is promising for future medicine. Mills, Voora, Payser, & Haga (2013). Since this is a relatively new therapeutic option, providers are not familiar with the test’s interpretation (Mills et al., 2013). Therefore, providers are not offering this option to their patients. Integrating pharmacogenetic testing into primary care is the most critical specialty as that is where most medications are prescribed.

- Providers should become familiar with the tests interpretation
- Discuss with patients the purpose of the test
  - The roles genes play in medication metabolism
- Risk vs Benefit
- Limitations
- Future benefits the test has to offer
  - Providers will know how a certain medications will metabolize leading to quicker symptom relief for many conditions
  - Will also allow for a warning to patients of certain side effects

With more research, it appears pharmacogenetic testing could be standard of care as a screening tool not only for anxiety medications but for several other health conditions. Once a patient is tested, clinicians will know how several different classes of medications work based on an individual’s genetic makeup. Thus, reducing the trial and error method of medication management, decreasing healthcare costs, and increasing healthcare efficacy.

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## Acknowledgements

I would like to thank my family, friends, UND PA classmates of 2019, and the physician assistant faculty at UND for your support, guidance, and encouragement in my journey of becoming a physician assistant. I would like to give a special thank you to Russ Kauffman, Dr. Nathan Timmer, MD, Dr. Matthew Christiansen, PhD, and Dr. Marilyn Klug, PhD for your input in the development of this scholarly project. Your expertise in this topic is greatly appreciated and instrumental in helping me complete my independent study project and education. I would also like to thank many patients that I have met in my clinical experiences diagnosed with anxiety. You inspired me to choose this topic, to help better understand, treat, and manage patients with anxiety in my future practice