A Pharmacogenetic Testing Guideline for Utilization in Mental Health

Ibha Sedenu, ARNP
Touro University Nevada
DNP Project Chair: Dr. Denise Zabriskie
DNP Project Member(s) Dr. Rhone D'Errico

In partial fulfillment of the requirements for the Doctor of Nursing Practice

Introduction

- Depression is one of the most common mental health disorders in the United States (Brody, Pratt, and Hughes, 2018).
- Psychotropic medications are recommended for mental health disorders such as depression.
- However, their use raises concerns over their efficacy and adverse effects on patients.
- Pharmacogenetic testing(PGT) has been proposed as a measure for providing prescribers with insights into the medications that would be most suitable for individual patients, but PGT are underutilized.
- This project involved the development of a standardized PGT guideline for use in a mental health clinic with the aim of enhancing mental health.

Among providers in an outpatient mental health clinic (P), would the implementation of a pharmacogenetic testing guideline (I), compared with no guideline (C), reduce patient return visits due to medication intolerance (O), within a period of four weeks?

- The objectives of this DNP project are:

  Develop a PGT guideline for use in a mental health clinic.

  To improve provider knowledge, identify the benefits of PGT, and improve use of the PGT guideline.

  To decrease the number of patient return visits for medication management or adjustments and reduce side effects.

Project Overview

- The project is a quality improvement (QI) project
- The project adopted a quantitative methodology, which is applied to analyze statistical data.
- Data on return visits were collected before and after the implementation of a standardized pharmacogenetic testing guideline.
- Data obtained was imported into R software.

Research

- A review of available literature on PGT in mental health settings was conducted.
- Prior research supported appropriateness for the PGT project as they facilitated the determination of the effect of PGTs on medical intolerance and related return visits among patients in the outpatient mental health clinic.

Research

- Lelmini et al. (2018) conducted a quantitative, observational study to investigate the role of PGTs in supporting BPD treatment. The researchers opined that the tests could assist mental health practitioners to identify patients with a high likelihood of experiencing adverse effects as well as expanding their understanding of the influence of genetic variation and drug response.

- Gardner, Brennan, Scott, and Lombard (2014) investigated the effectiveness of PGT in improving patient outcomes in psychiatry using a review of literature on the topic. The researchers noted that PGT enhance the efficiency in identification of effective therapies in mental health practice; thereby, protecting patients from prolonged suffering and high health costs.

- Health Quality Ontario (2017) assessed the impact caused by GeneSight Psychotropic test in comparison to the standard care provided in support of the choice for psychotropic treatments for patients experiencing mood, anxiety, or schizophrenia. The results showed that the patients who had been provided with GeneSight test had improved reactions towards depression medication, more significant enhancements in depression measures, and greater clinician and patient satisfaction in comparison to patients who had received the usual treatment.

Theoretical Framework

Lewin’s Three-Step Model

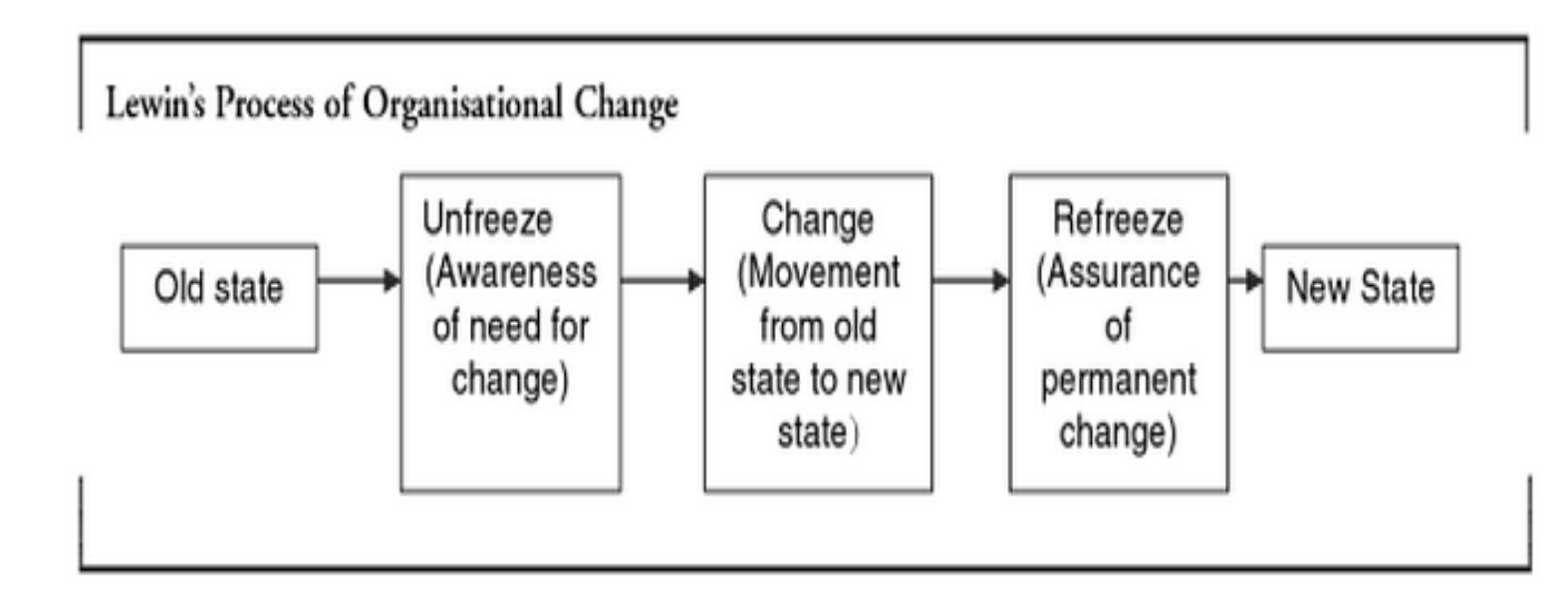


Figure 1. Lewin's change management model. Source: Singh, K. (2010). *Organizational change and development (2nd Ed)*. New Delhi, India: Excel Books.

According to Lewin, human behavior is influenced by dynamic driving and opposing forces.

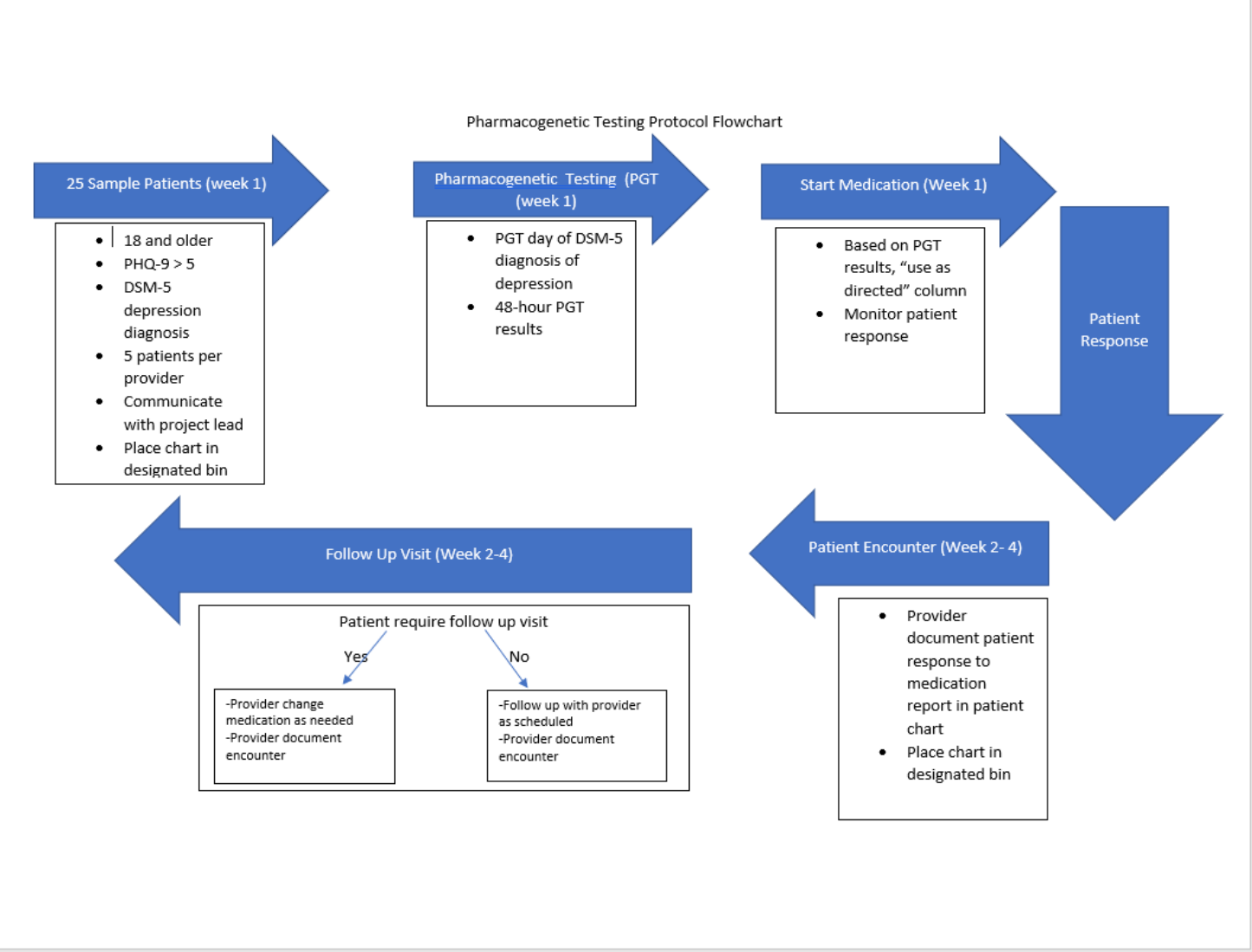
Driving forces push workers in the desired direction; thereby, facilitating change whereas restraining forces hinder change by pushing individuals in the undesired or opposite direction (Kritsonis, 2005).

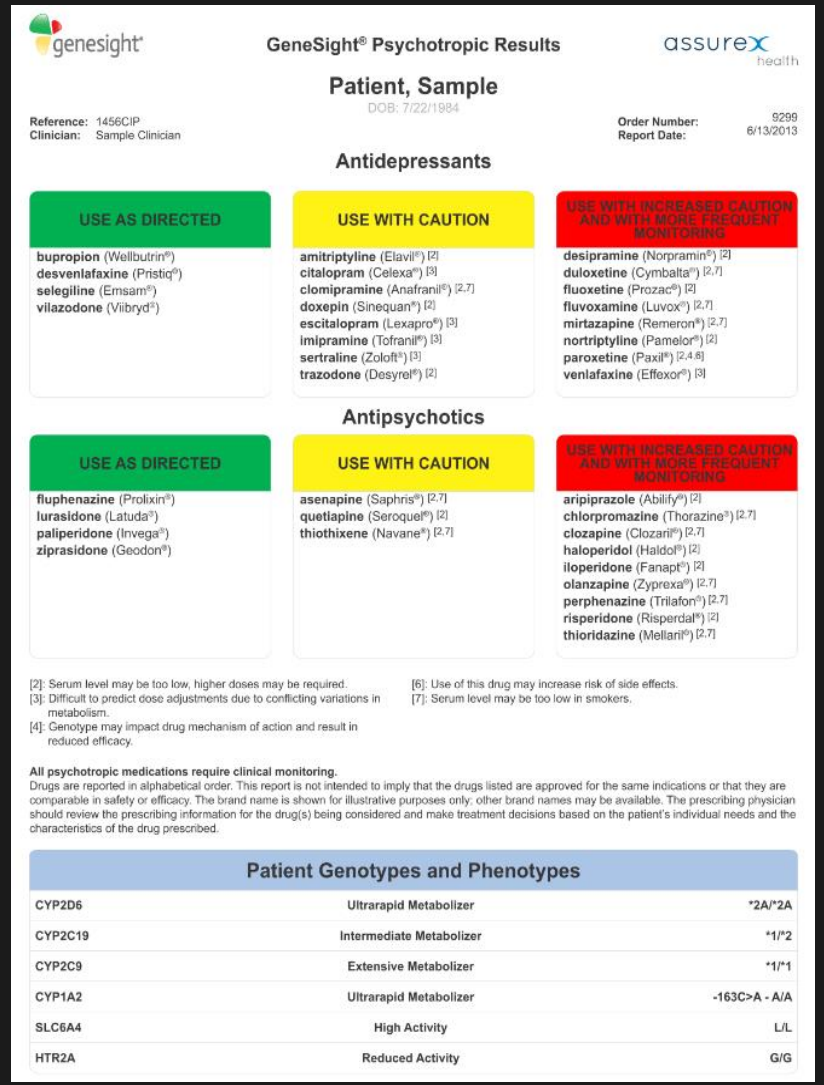
The model provides an integrated approach to effective implementation of planned change at the group, organizational, and societal levels (Burnes, 2004).

Materials

Materials	Quantity
Pre/Post Survey	10
PHQ-9 Questionnaire	100
Pharmacogenetic Chart Audit and Review Form	100
Pharmacogenetic Test Kit	100
Power Point Presentation	1
Recruitment Flyer	4

Protocol





genesight

GeneSight® Psychotropic Results

assurex health

Patient, Sample

DOB: 7/22/1984

Reference: 1456CIP
Clinician: Sample Clinician

Order Number: 9299
Report Date: 6/13/2013

Antidepressants

USE AS DIRECTED	USE WITH CAUTION	USE WITH INCREASED CAUTION AND WITH MORE FREQUENT MONITORING
bupropion (Wellbutrin®)	**amitriptyline** (Elavil®) [2]	**desipramine** (Norpramin®) [2]
desvenlafaxine (Pristiq®)	**citalopram** (Celexa®) [3]	**duloxetine** (Cymbalta®) [2,7]
selegiline (Emsam®)	**clomipramine** (Anafranil®) [2,7]	**fluoxetine** (Prozac®) [2]
vilazodone (Viibryd®)	**doxepin** (Sinequan®) [2]	**fluvoxamine** (Luvox®) [2,7]
	escitalopram (Lexapro®) [3]	**mirtazapine** (Remeron®) [2,7]
	imipramine (Tofranil®) [3]	**nortriptyline** (Pamelor®) [2]
	sertraline (Zoloft®) [3]	**paroxetine** (Paxil®) [2,4,6]
	trazodone (Desyrel®) [2]	**venlafaxine** (Effexor®) [3]

Antipsychotics

USE AS DIRECTED	USE WITH CAUTION	USE WITH INCREASED CAUTION AND WITH MORE FREQUENT MONITORING
fluphenazine (Prolixin®)	**asenapine** (Saphris®) [2,7]	**aripiprazole** (Abilify®) [2]
lurasidone (Latuda®)	**quetiapine** (Seroquel®) [2]	**chlorpromazine** (Thorazine®) [2,7]
paliperidone (Invega®)	**thiothixene** (Navane®) [2,7]	**clozapine** (Clozaril®) [2,7]
ziprasidone (Geodon®)		**haloperidol** (Haldol®) [2]
		iloperidone (Fanapt®) [2]
		olanzapine (Zyprexa®) [2,7]
		perphenazine (Trilafon®) [2,7]
		risperidone (Risperdal®) [2]
		thioridazine (Mellaril®) [2,7]

[2]: Serum level may be too low, higher doses may be required.
[3]: Difficult to predict dose adjustments due to conflicting variations in metabolism.
[4]: Genotype may impact drug mechanism of action and result in reduced efficacy.
[6]: Use of this drug may increase risk of side effects.
[7]: Serum level may be too low in smokers.

All psychotropic medications require clinical monitoring.
Drugs are reported in alphabetical order. This report is not intended to imply that the drugs listed are approved for the same indications or that they are comparable in safety or efficacy. The brand name is shown for illustrative purposes only; other brand names may be available. The prescribing physician should review the prescribing information for the drug(s) being considered and make treatment decisions based on the patient's individual needs and the characteristics of the drug prescribed.

Patient Genotypes and Phenotypes

CYP2D6	Ultrarapid Metabolizer	*2A/*2A
CYP2C19	Intermediate Metabolizer	*1/*2
CYP2C9	Extensive Metabolizer	*1/*1
CYP1A2	Ultrarapid Metabolizer	-163C>A - A/A
SLC6A4	High Activity	L/L
HTR2A	Reduced Activity	G/G

Findings

Across all providers, there was a mean of 3.1% (standard error 0.2%) within-provider increase in visits that included a genetic test after the education compared to before education (Table 1).

Every provider showed an increase, although starting values for each provider varied between 1-3% (Figure 1).

The results showed that visits after education increased significantly.

Table 1: Change in PGT by provider

	Genetic Tests	Return Visits		
	Pre-Education	Post-Education	Diff	
A	2.0%	4.8%	2.8%	
B	1.3%	3.9%	2.6%	
C	1.6%	5.3%	3.8%	
D	1.3%	4.2%	2.9%	
E	3.2%	6.7%	3.5%	
				SE
		All	3.1%	0.2%

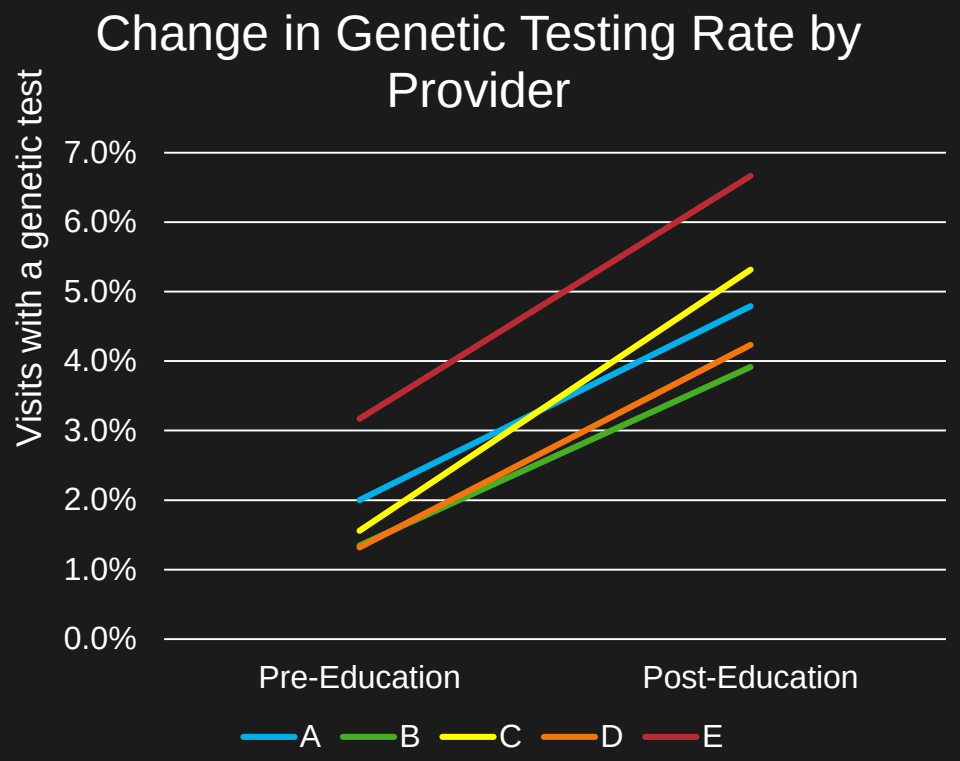


Figure 1

Findings

In the evaluation of the change in return visits by provider, it emerged that there was a reduction in the number of return visits after the education with a mean reduction of -3.7% and a standard error of 0.6. The analysis was performed using linear mixed effects model in r.

This shows that the proposed standardized pharmacogenetic guideline had a great impact in reducing the number of return visits for every provider within the mental health clinic.

Table 1: Change in Return visits by provider

	Genetic Tests	Return Visits		
	Pre-Education	Post-Education	Diff	
A	7.7%	3.2%	-4.5%	
B	5.1%	2.5%	-2.6%	
C	5.9%	4.0%	-1.9%	
D	6.9%	2.9%	-4.0%	
E	9.5%	4.0%	-5.5%	
				SE
		All	-3.7%	0.6%

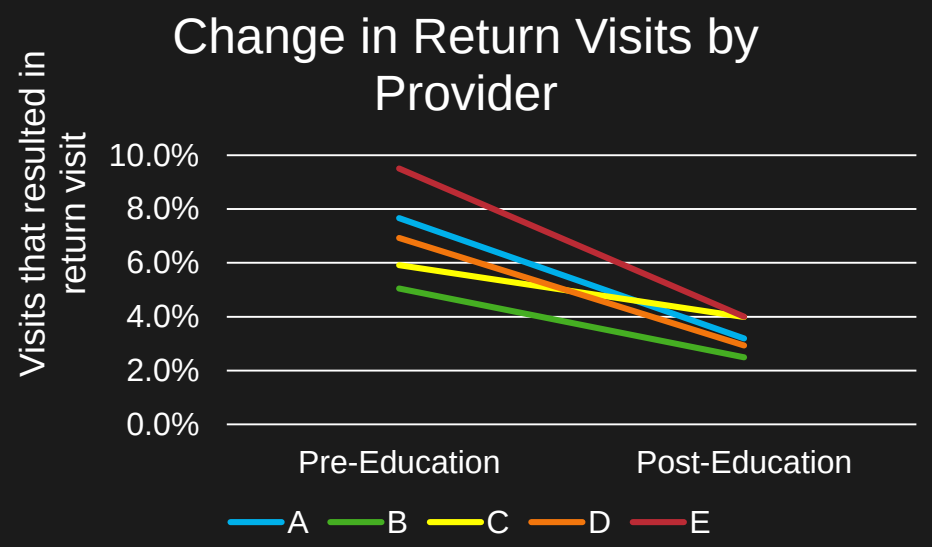


Figure 2

Findings

In the evaluation of the change in return visits by provider, it emerged that there was a reduction in the number of return visits after the education with a mean reduction of -3.7% and a standard error of 0.6. The analysis was performed using linear mixed effects model in r.

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				SE
		All	-3.7%	0.6%

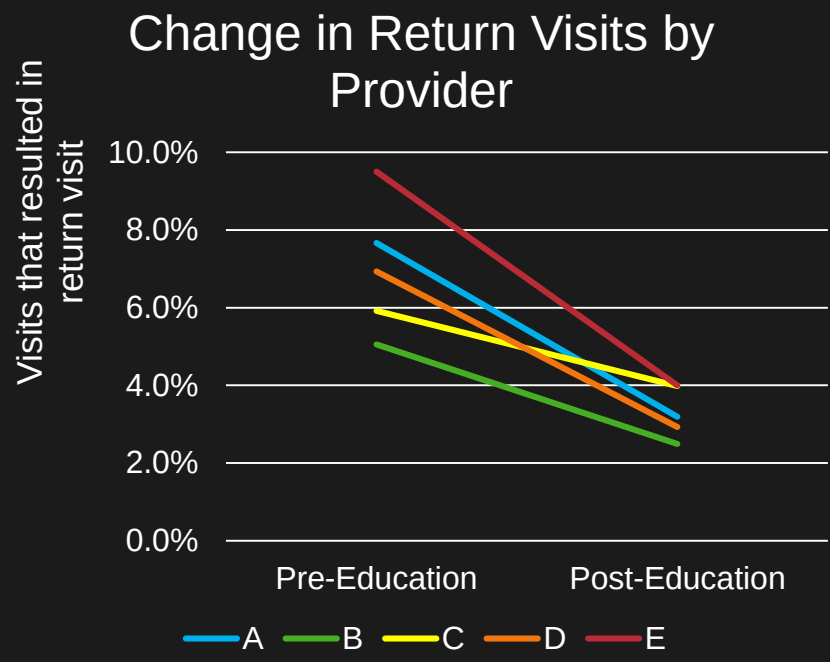


Figure 2: Change in Return Visits by Provider

Significance to Nursing

- Nursing is interested in wellbeing of patients and should be concerned with providing effective treatment.
- PGT provides and avenue for nurses to ensure increased patient satisfaction through providing effective medication as opposed to relying on trials and errors in medicine administration (Fulton et al., 2018).
- The implementation of PGT ensures nurses make a contribution in ensuring improved health outcomes of patients and ensures personalized medication is administered to different patients as per their reactions to different medications.

Significance to Nursing

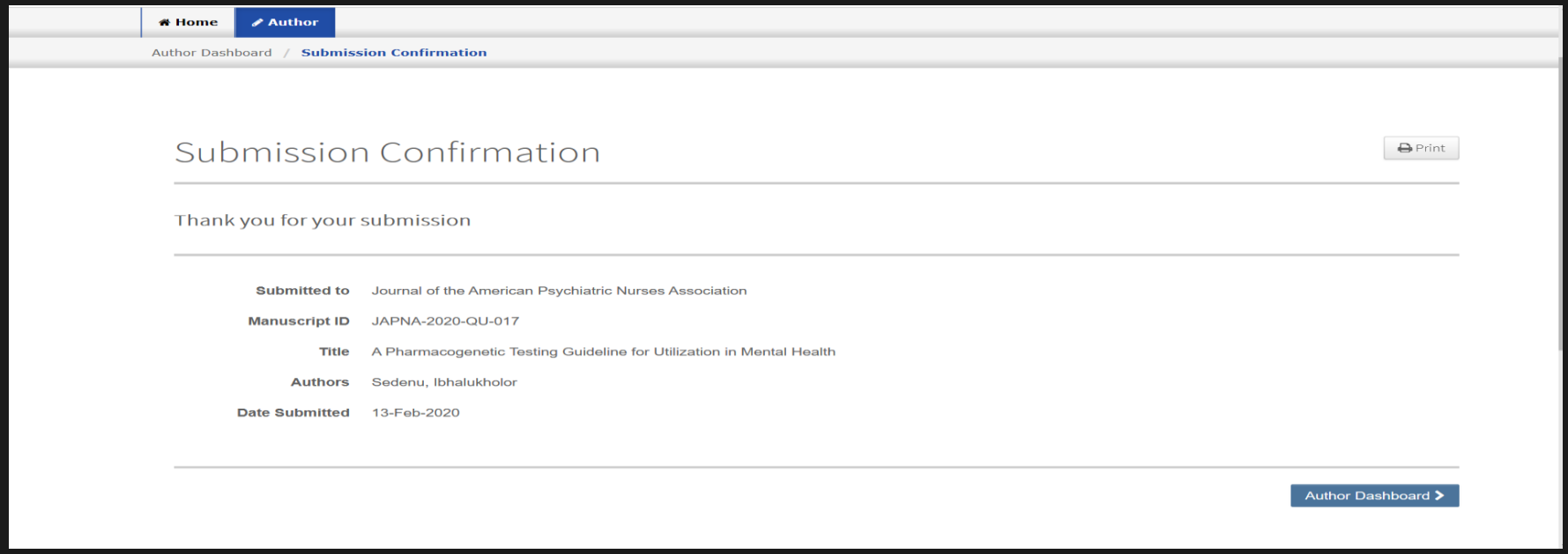
- The implementation of the protocol in the use of PGT presents an opportunity for nurses to reduce the cost of healthcare and reduce financial burden among patients.
- This innovation further advances the argument that pharmacogenetics has the potential to optimize medication response and identify medication toxicity (Kudzi, Addy & Dzudzor, 2015). Nurses play a vital role in ensuring patient safety outcomes and should be knowledgeable in the effects pharmacogenetics has on the population they serve. APNs can enhance positive patient outcomes by adopting precision medicine through implementation of PGT (Fulton et al., 2018).

Limitations

- The project use of quantitative research method.
- Short Implementation time frame prevented for a larger sample data
- Data collected with the use of a quantitative approach is narrower and sometimes superficial when compared to the qualitative data.
- The project relied on data from five providers in the private practice. As explained by Miočević, MacKinnon, and Levy (2017), having too small of a sample size minimizes the power of the research while increasing the margin of error. Very small sample sizes can reduce the reliability of project findings.

Dissemination

- The project findings will be shared with mental health specialists and the administrators at the clinic using a PowerPoint presentation and a poster March 20th, 2020.
- Interested in mental health seminars and workshops at the local or state level at a later date.
- Lastly, the project findings may be disseminated to other scholars and practitioners through publication in a nursing journal such as the Journal of The American Psychiatric Nurses Association.



Areas for Further Quality Improvement

- The project involved the development of a pharmacogenetic testing guideline with the aim of improving mental health providers' knowledge in PGT, minimizing repeat appointments, and enhancing patient experiences.
- PGT can be evaluated in other settings to establish whether similar results would be obtained. For instance, PGT can be tested for other mental disorders such as schizophrenia and bipolar disorder (Routhieaux et al., 2018).
- Further QI projects need to be conducted using a larger sample size to determine whether the present results were affected by the small sample used.

Questions

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