2020

# Opioid Knowledge, Confidence, and Concern of Bethel University Physician Assistant Students

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# OPIOID KNOWLEDGE, CONFIDENCE, AND CONCERN OF BETHEL UNIVERSITY PHYSICIAN ASSISTANT STUDENTS

A MASTER'S THESIS SUBMITTED TO THE GRADUATE FACULTY

GRADUATE SCHOOL BETHEL UNIVERSITY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTERS OF SCIENCE IN PHYSICIAN ASSISTANT

JUNE 2020

## ABSTRACT

With more than 130 people dying daily, 47,000 overdose-related deaths per year, and $55 billion in societal costs, the opioid epidemic is producing widespread, catastrophic consequences on the population and healthcare system. Healthcare providers report high concern and lack of confidence that their training prepared them adequately to manage chronic pain with opioid therapy. There is insufficient evidence determining whether educating healthcare providers on opioid prescribing guidelines leads to improved knowledge, confidence, and a decrease in concern. The aim of this study is to assess the knowledge, confidence, and concern of 2020 Bethel University physician assistant (PA) students of opioid prescribing before and after completing a series of opioid prescribing training modules created by Centers for Disease Control and Prevention (CDC). 28 Bethel University PA students were included, with one participant's data being removed due to not completing the post-assessment. Results demonstrated statistically significant increases in knowledge (pre-assessment 12.26 ± 2.25, post-assessment 14.96 ± 1.58, $t(26) = 6.55$, $p = 0.00$) and confidence (pre-assessment 3.70 ± 2.00, post-assessment 5.89 ± 1.42, $t(26) = 4.73$, $p = 0.00$), and decrease in concern (pre-assessment 7.18 ± 1.9, post-assessment 5.52 ± 1.78, $t(26) = -4.60$, $p = 0.00$) regarding appropriate prescribing of opioids. These findings suggest that CDC's opioid prescribing training modules are effective in educating PA students, improving their knowledge, confidence and decreasing concern when prescribing opioids.

**ACKNOWLEDGEMENTS**

The researchers would like to acknowledge the people with whose help it was possible to accomplish this project: Lisa Naser, MS, PA-C, Cindy Goetz, MPAS, PA-C, and Chad Peterson, PharmD. We also acknowledge Richelle M. Williams, PhD, ATC for her statistical expertise.

We acknowledge and appreciate the participation of all the students of Bethel University PA class of 2020 who willingly participated in this research project.

# TABLE OF CONTENTS

## LIST OF APPENDICES

# LIST OF TABLES

## LIST OF FIGURES

# Chapter 1: Introduction

## Introduction

Thirty years ago, amidst the burgeoning pain epidemic when pain was regarded as the "fifth vital sign," the addictive nature of pharmaceutical-grade opioids was not fully understood (Maxwell, 2011). Since that time, opioid prescriptions by healthcare providers have increased in strength and duration, which has become a factor that has led to the current opioid crisis in the United States (Shah et al., 2017; Martin et al., 2011; Hoots & Seth, 2018). As of 2017, opioid misuse in the United States has been designated a public health emergency (US Department of Health and Human Services, 2017). Opioid misuse and abuse may often progress to addiction and the creation of widespread problems on the healthcare system and the lives of patients (Seth et al., 2018). These problems are adversely affecting large portions of the US, and statistics illustrate the problem is not slowing down (Hoots & Seth, 2018; Birnbaum et al., 2011).

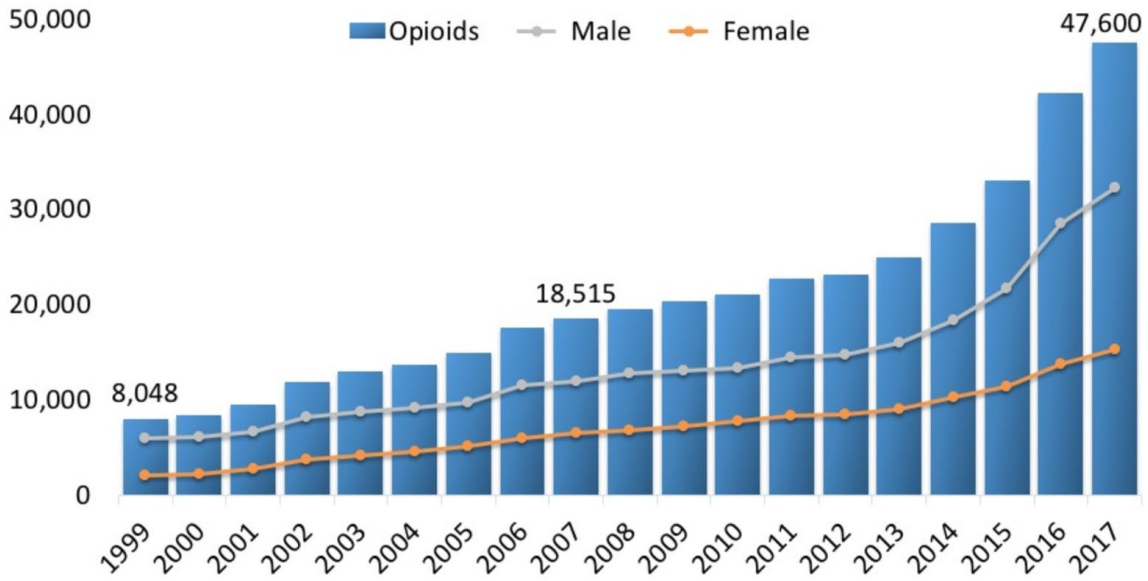
Healthcare providers are presented with difficult and unexpected challenges when prescribing opioids: including the daunting task of discerning whether patients are drug seeking or actually in need of opioids (Fields, 2011). This thesis presents current opioid epidemiology, the pathology behind opioid addiction, and healthcare provider opioid prescribing knowledge. The researchers will then evaluate physician assistant (PA) students' knowledge, confidence, and concern regarding proper opioid prescribing practices before and after completing a series of training modules based on opioid prescribing guidelines created by the Centers for Disease Control and Prevention (CDC).

## Background

Opioid misuse and abuse are significant issues in the US both economically and on healthcare providers (Birnbaum et al., 2011). In 2007, the plight of opioid abuse subjected the US to an estimated $55.7 billion in societal costs (Birnbaum et al., 2011). The US Department of Health and Human Services (2018) estimates that 130 or more people die in the US every day from an opioid overdose. The Morbidity and Mortality Weekly Reports (MMWR), published by CDC, emphasize the extent and reality of the opioid crisis. Figure 1, from MMWR, illustrates that in 2016, an estimated 42,249 opioid-related overdose deaths occurred, and in 2017, opioid-related overdose deaths rose to an estimated 47,600 (Scholl et al., 2018; National Institute on Drug Abuse, 2018).

**Figure 1**

*US National Drug Overdose Deaths Involving Opioids*



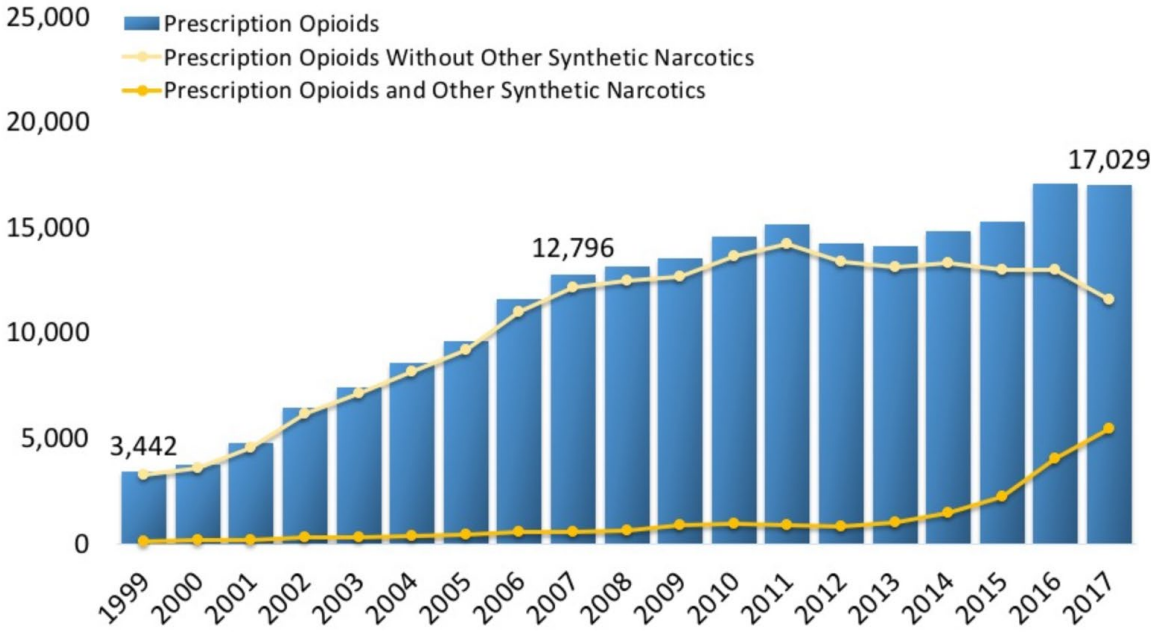

*Note.* Number of deaths among all ages by gender; 1999-2017 estimated in thousands. Adapted from "Opioid Death Rates," in National Institute on Drug Abuse, by Morbidity

and Mortality Weekly Reports, CDC Wonder, 2018. Retrieved March 13, 2019 from (https://www.drugabuse.gov/related-topics/trends-statistics/overdose-death-rates). In the public domain.

Approximately 40% of these opioid-related deaths are due to prescription opioids (Hoots & Seth, 2018). Figure 2, from MMWR, depicts the prescription opioid-related overdose deaths over the last 18 years.

**Figure 2**

*US National Drug Overdose Deaths Involving Prescription Opioids*




*Note.* Number of deaths among all ages, 1999-2017; estimated in thousands. Adapted from "Opioid Death Rates," in National Institute on Drug Abuse, by Morbidity and Mortality Weekly Reports, CDC Wonder, 2018. Retrieved March 13, 2019 from (https://www.drugabuse.gov/related-topics/trends-statistics/overdose-death-rates). In the public domain.

Traditionally, opioid prescriptions have been used for the treatment of pain, but due to the nature of opioids having an imitating effect on endorphins, patients medicated with opioids are at a heightened risk of abuse, misuse, and addiction (Chahl, 1996). Furthermore, opioids have been prescribed to reduce anxiety and be used as a mild sedative (Fields, 2011). When patients take opioids long-term (continued use one year after prescription) for pain management, they are at greater risk of developing a tolerance to the opioid analgesic effects (Kosten & George, 2002). Once tolerance to the opioid's analgesic effects emerges, the brain and body demand increasingly higher doses to attain identical results as the previous smaller doses, resulting in a vulnerable state of chemical dependence (Kosten & George, 2002). Chemical dependency evolves into a physiologic and psychologic response, which manifests as overwhelming withdrawal symptoms if the drug is taken away (Kosten & George, 2002). Often, opioid dependence results in individuals starting to use their prescription outside of its intended use (misuse) (Kosten & George, 2002). The dependence process can then lead to the development of addiction, when the drug becomes a physiologic need (Kosten & George, 2002).

To date, opioids are still "the most potent and reliable analgesic agents" (Fields, 2011, para. 1). While no longer considered the first line prescription for chronic pain, opioids often are designated for acute pain (Fields, 2011). Chronic pain is medically described as unremitting or intermittent pain persisting for three months or longer (Treede et al., 2015). Whether acute or chronic, pain disrupts and weakens overall physical, mental, social, and spiritual well-being. "Chronic pain is a significant global public health concern associated with risk of depression, anxiety, unemployment, and opioid abuse." (Webster et al., 2017, para. 1). Chronic pain can be devastating; one

estimate reported that 61% of patients with diagnosed chronic pain were unable attend work or perform job duties due to effects of their persistent pain (Breivik et al., 2006). Additionally, 60% of patients with chronic pain visited a healthcare provider more than once in the past six months, and 40% of patients with chronic pain thought their pain was inadequately managed (Breivik et al., 2006).

In 2011, the Institute of Medicine estimated at least 100 million American adults suffer from chronic pain; excluding those in prison, the military, or long-term care facilities (Institute of Medicine, 2011). Furthermore, an analysis performed by the National Center for Complementary and Integrative Health approximates that at least 25.3 million American adults suffer daily with some manner of chronic pain (Nahin, 2015). The more frequent and commonly assessed categories of non-cancer chronic pain conditions typically are associated with joint pain (e.g., osteoarthritis), back and neck spinal pain (e.g., radiculopathies), recurring headaches, and neuropathies (Tsang et al., 2008). Several studies argue that opioid misuse is more likely to occur in patients who take opioids continually and for extended periods of time for managing chronic pain; although, the correlation between protracted use and misuse of opioids as of yet is circumstantial (Fields, 2011).

In 2016, CDC released guidelines on opioid prescribing in an effort to guide the clinical practice of healthcare providers (Dowell et al., 2016). CDC's guidelines include recommendations on opioid prescription type (immediate-release vs. extended-release), the dosage in Morphine Milligram Equivalents (MME), and duration of opioid use (Dowell et al., 2016). The 2016 CDC guidelines are supported by evidence that opioid addiction risk is at its lowest when treating chronic pain patients who were previously

opioid drug-naive (Fields, 2011). Additionally, CDC provides recommendations to healthcare providers on how to discuss goals of opioid treatment with patients as well as when and how to discontinue opioid use (Dowell et al., 2016). While CDC guidelines provide healthcare providers with recommendations for safer and appropriate methods and strategies for prescribing opioids, research has demonstrated that prescribing habits have not been in line with the 2016 CDC guidelines (Dowell et al., 2016; Shah et al., 2017). Specifically, data collected by Shah, et al. (2017) found when patients were prescribed opioids for longer durations and at higher MME doses than CDC recommendations, patients were at higher risk for prolonged, chronic opioid use. Because research has shown long-term opioid treatment risk factors are related to dosage and length of prescription, healthcare providers may be contributing to the opioid epidemic with current prescribing practices (Shah et al., 2017).

Providers face inordinate amounts of pressure to provide appropriate treatment and sufficient pain relief, which is regarded as a standard of care and, in some states, required by law (Fields 2011). This standard has created what many healthcare providers feel is a dichotomic, moral quandary (Fields, 2011; Rosenblum et al., 2008). On the one hand, prescribers know about the possible serious and sometimes fatal side effects of opioids, but on the other, they are required by conscience and, in many states, by law to help alleviate their patients' suffering (Fields 2011). When physicians, PAs, advanced practice nurses, and registered nurses working primarily in primary care were polled, the majority expressed that they were not confident in chronic pain management (Pearson et al., 2017). Additionally, 63% of physicians, working in family medicine, internal medicine, and pediatrics, surgeons, and nonsurgical specialists, reported they did not

believe they received adequate instruction and training for appropriately managing chronic pain (Darer et al., 2004).

Inadequate opioid prescribing education might also lead to diminished confidence in providers' opioid prescribing abilities. However, structured education regarding opioid prescribing recommendations may combat the lack of healthcare provider confidence and reduce the incidence of long-term opioid use. Chronic opioid use may only progress as the US population continues to age, and the need for chronic pain treatment will most likely continue to grow (Darer et al., 2004).

**Problem Statement**

Healthcare providers report not feeling confident and that their training did not prepare them adequately to manage chronic pain and prescribing opioids (Darer et al., 2004; Pearson et al., 2017). Healthcare providers also communicated that opioid abuse and addiction was a concern when prescribing opioids (Pearson et al., 2017). There is insufficient evidence determining whether educating healthcare providers with CDC's opioid prescribing guidelines leads to improved knowledge.

**Purpose**

The objective of this study is to assess the knowledge, confidence, and concern of Bethel University PA students in prescribing opioids for the treatment and management of chronic pain conditions by utilizing CDC's opioid prescribing module training. Research about PA students' knowledge, confidence, and concern in prescribing opioids in their didactic and clinical training is lacking.

**Research Questions**

Therefore, the following research questions will be investigated and analyzed in this study.

1. How is PA student knowledge increased following completion of the CDC opioid prescribing module training?
2. How is PA student opioid prescribing confidence increased following completion of the CDC opioid prescribing module training?
3. How is PA student concern affected with respect to opioid prescribing before and after completion of the CDC opioid prescribing module training?

**Significance of the Problem**

The rates of opioid prescriptions in the United States have been declining in recent years, but this is not consistent across the country (Hoots & Seth, 2018). Large portions of the south and northeast US have seen dramatic increases in both the number and MME dosage of opioid prescriptions as the national rates have declined (Hoots & Seth, 2018). One trend that is consistent nationwide is the increasing duration of opioid prescriptions (Hoots & Seth, 2018). Over the course of the previous 12 years, the average opioid prescription duration has increased from 13.3 days to 18.3 days while rates of shorter prescriptions have decreased (Hoots & Seth, 2018). This trend demonstrates that fewer opioid prescriptions are being taken for short durations and the average length of opioid prescriptions is continuing to increase in duration.

A majority of physicians, PAs, and nurse practitioners do not feel confident or prepared to prescribe opioids for chronic pain (Pearson et al., 2017). Additionally, 55%

of these same respondents report not following a protocol when prescribing opioids. However, when respondents stated they adhered to a recommended opioid protocol, the result correlated with having increased confidence in administering and regulating opioid treatment to patients with chronic pain (Pearson et al., 2017).

**Definition of Terms**

The terms listed below are important to know regarding the research presented in this study.

Acute Pain: Transient pain with a duration less than 3 months (Treede et al, 2015).

Abuse: "Intentional, non-therapeutic use of a drug product or substance, even once, to achieve a desired psychological or physiological effect" (US Food and Drug Administration, 2017).

Chronic Pain: "Persistent or recurrent pain lasting longer than 3 months" (Institute of Medicine, 2011; Treede et al., 2015).

Dependence: "A state that develops as a result of physiological adaptation in response to repeated drug use, manifested by withdrawal symptoms after abrupt discontinuation or a significant dose reduction of a drug" (US Food and Drug Administration, 2017).

Long-term use: "Continued use of opioids greater than one year after initial prescription" (Shah et al., 2017).

Misuse: "Use of a medication (for a medical purpose) other than as directed or as indicated, whether willful or unintentional, and whether harm results or not" (Katz et al., 2007).

Morphine Milligram Equivalents: "Standard value based on morphine and its potency which helps determine the potency of opioid doses and is useful if converting from one opioid to another" (Hoots & Seth, 2018).

Opioids: A class of legal and illegal drugs derived from morphine (an opiate) and are commonly prescribed to treat pain (e.g., heroin, oxycodone, hydrocodone, methadone, and fentanyl) (Rosenblum et al., 2008).

**Conclusion**

The current prevalence of opioid abuse and rising overdose rates occurring in the US demands a requirement for appropriate and thorough training and education for healthcare providers. CDC has released guidelines to give providers a structured plan on how to prescribe opioids safely and effectively as well as how to discuss opioid use related risks and benefits with patients. CDC guidelines recommend shorter opioid durations and lower MME doses for prescribing opioids to patients, which have both been found to reduce unnecessary, prolonged opioid use (Martin et al., 2011; Shah et al., 2017). However, it is currently unclear how many healthcare providers have implemented CDC guidelines, suggesting the need to evaluate training methods for healthcare providers.

The literature review in the following chapter will provide an introduction and overview of opioids, including their mechanism of action, how opioids cause tolerance which leads to chemical dependence and addiction, and to identify the different classes of opioids. The upcoming chapter will then present current trends of opioid prescribing and overdose deaths in the US and provide an overview of the topics and strategies covered in the 2016 CDC guidelines and recommendations for prescribing opioids for chronic pain.

Finally, an account on the current literature relating to the knowledge, confidence, and concern healthcare providers have when prescribing opioids will be addressed.

# Chapter 2: Literature Review

## Introduction

Opioids are a powerful, dynamic class of drugs which are prominent in the role of carefully considering and deciding between both short and long-term pain management strategies (Rosenblum et al., 2008). Opioids are essentially chemical molecules that couple with several distinct neurological binding sites (receptors), and when bound to said receptors, block the transmission of pain and cause a state of pleasure and happiness, known as euphoria (Fields, 2011). Opioids can be used safely and effectively by providers to help patients, yet they also carry potential serious side effects, including their highly addictive nature and risk of overdose (Kosten & George, 2002; Rosenblum et al., 2008; Webster et al., 2017). Opioids, specifically illicit opioids, are the leading cause of overdose-related fatalities in the US (Hoots & Seth, 2018). While overdoses and addictions due to opioid prescriptions are less than half of the overall figures, these overdoses and addictions are more easily tracked and regulated than non-prescription opioids (Hoots & Seth, 2018).

Many providers still express uncertainty and worry as far as prescribing opioids to their patients, making provider worry and uncertainty a valid concern (Darer et al., 2004; Pearson et al., 2017). From 2009 to 2016, deaths resulting from prescription opioid overdose have risen by 18% (Atluri et al., 2018). Prescribers are also influenced by what is known as "hidden curriculum," or what providers are learning from society and influencers around them – both medical and non-medical (Fields, 2011). Studies have found that many opioid prescriptions are written incorrectly, causing either inadequate pain management or increased side effects including drug dependency and addiction

(Webster et al., 2017). As mentioned in chapter one, opioid misuse, abuse, and addiction are creating widespread problems on the US healthcare system and in the lives of patients (Seth et al., 2018). To fully conceive the reasons why opioid dependency is so rampant and how the addiction develops, it is necessary to have a thorough understanding of the neurophysiological operations and mechanics of opioids within the body and how the pathology of addiction develops (Kosten & George, 2002). The remaining sections in this chapter will examine the neurobiology of opioids, pathology of drug tolerance, dependence, and addiction, and review the current literature on opioid prescribing and healthcare provider opioid knowledge in the US.

**Opioid Mechanism of Action**

With respect to biochemical interactions, chemical make-up, and general function within the human body, opioids are grouped into two broad, nonspecific categories called endogenous and exogenous opioids. Endogenous opioids, also known as endorphins, enkephalins, and dynorphins, are naturally occurring neurotransmitters – messenger molecules that relay and transmit signals – produced in the pituitary gland in the brain and adrenal medulla, respectfully (Sprouse-Blum et al., 2010). These endogenous peptides are released in response to stimuli such as pain, stress, sexual activity, fear, and during and after prolonged exercise (Sprouse-Blum et al., 2010). Endorphins and enkephalins, specifically, play a role in sustaining equilibrium with nutrient metabolism, aid with cardiovascular modulation, and are the natural mediators of pain relief. These neuropeptides essentially provide the human body with a way to adapt to extrinsic factors and stimuli that the body is consistently exposed to (Chahl, 1996). Exogenous opioids mimic the effects of endogenous opioids in many ways, but primarily to mediate the

body's physiologic pain response. However, these exogenous chemicals are artificial and pharmacologically modified opioids with stronger degrees of potency to treat pain in clinical situations (Chahl, 1996).

Most opioids, whether endogenous or exogenous, bind to three distinct types of cell membrane neurotransmitter receptors; mu (μ), delta (δ), and kappa (κ) (Pasternak, 1993). All three receptors types are widely disseminated throughout the central nervous system (CNS), the brain and spinal cord, and the peripheral nervous system (PNS), peripheral nerves and nerve cells located outside the brain and spinal cord. In the brain, opioid receptors are most abundant in the ventral tegmental area (VTA), tractus solitarius, periaqueductal gray area (PAG), thalamus, hippocampus, and cerebral cortex (Kosten & George, 2002; Yaksh, 1997). In the spinal cord, opioid receptors are distributed evenly, but with a higher concentration located in the substantia gelatinosa (SG) (Trivedi & Shaikh, 2007). When activated by opioids, all three receptor types elicit similar effects with varying degrees of each; however, at the same time, they also operate distinctly from one another in various, unassociated biological functions (Pasternak, 1993). The shared attributes of μ, κ, and δ receptors are predominantly involved in the role of analgesia or inhibiting or suppressing an organism's response to pain (Pradhan et al., 2012). In addition to analgesia, all three receptors types induce mild to intense euphoric effects and neuronal activity inhibition. The degree of euphoria generated depends on which of the three receptor types are being stimulated, while the degree of analgesia is contingent on dosage, potency, and whether the opioid is synthetic vs non-synthetic (Pradhan et al., 2012). When stimulated by exogenous opioids, μ receptors elicit various significant CNS and PNS effects. The CNS effects include powerful inhibition of acute pain, substantial

euphoria, stress regulation, respiratory depression, sedation, urinary retention, decreased gastrointestinal motility (causing constipation), pruritus, urticaria, mild to moderate reduction in heart rate, and physical dependence (Al-Hasani & Bruchas, 2011). Kappa receptors, when activated, primarily regulate mood, stress, consciousness, feeding, gut motility, and spinal analgesia. But when stimulated by moderate to high dose of exogenous opioids, κ receptors may cause pupillary constriction, diuresis, sedation, and dysfunctional effects such as dysphoria and psychomimetic effects, including hallucinations, delirium and/or delusions (Trivedi & Shaikh, 2007; Pradhan et al., 2012). While having positive effects in powerful spinal and supraspinal analgesia, δ receptors are distinct from κ and μ receptors in respect to opioid type selectivity. In addition, δ receptors potentially elicit distinct negative effects such as hypotension and decreased brain and myocardial oxygen demand when activated (Trivedi & Shaikh, 2007). Mu receptors are considered the most clinically relevant target for acute analgesia and yield the most significant benefits, but also pose a greater risk for deleterious effects (Pathan & Williams, 2012).

**Opioid Pathology: Tolerance, Dependence & Addiction**

Acute and chronic pain can be considerably debilitating at times; thus, warranting pharmacologic intervention (Chahl, 1996). Exogenous opioids, such as the prototypic opiate, morphine, or synthetic types like fentanyl, have been the means and cornerstone for analgesic management in patients; more commonly for acute pain or chronic pain with moderate to severe intensity (Savage et al., 2008). Overtime, with continuous exposure to the same or similar drugs, patients undergo an adaptive process called tolerance (Dumas & Pollack, 2008; Savage et al., 2008). Opioid tolerance develops

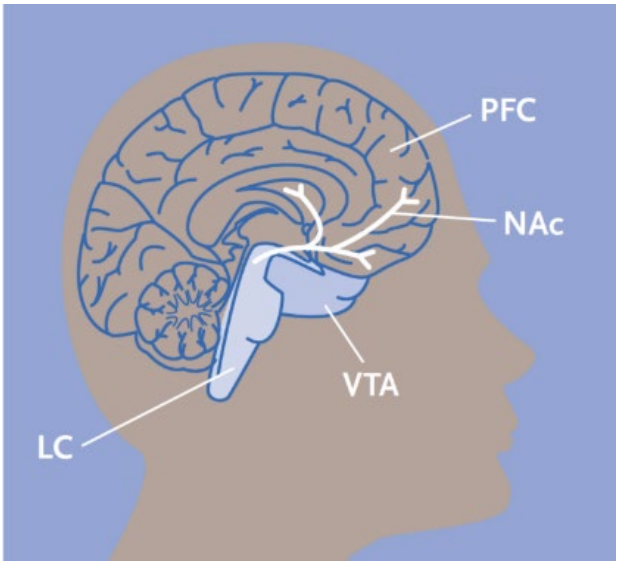
rapidly and occurs when the μ opioid receptors no longer respond to the repeated stimulation of opioids (Dumas & Pollack. 2008). Physiologically, the μ receptors have acclimated to the same chemical signal and become desensitized to repeated triggers. The opioid receptor system is exceptionally unrivaled to any other receptor system in the body to the degree that desensitization occurs at a quicker rate (Savage et al., 2008). An opioid, when bound to μ receptors will trigger an enzyme called adenylate cyclase that fires impulses along neurons to achieve the desired effect. When desensitized, the receptor demands extra stimulation in order to trigger adenylate cyclase to achieve the same effect be it analgesia or euphoria (Dumas & Pollack, 2008). Therefore, higher and higher doses of prescription opioid are necessary to maintain analgesic effects long-term (Savage et al., 2008). Opioid tolerance is regarded as a pivotal step in the direction toward chemical dependence and addiction; although, tolerance is neither a state nor indicator of dependence or addiction (Savage et al., 2008).

Despite the tremendous pain relief benefits that opioid therapy produces, as discussed previously, these drugs not only act on individual pain receptors, but they also produce a significant synergistic effect in the thalamus, hippocampus, and midbrain where the mesolimbic reward circuit operates (Kosten & George, 2002). When stimulated through opioid binding, the reward circuit signals the cells in the VTA to release dopamine, whose function is that of a hormone and neurotransmitter. Dopamine subsequently stimulates the nucleus accumbens (NAc) in the prefrontal cortex (PFC) giving rise to emotions of euphoria and well-being. Often, when exogenous opioid binding is involved, euphoric feelings may reach unnatural, elevated levels (Kosten &

George, 2002). Figure 3 portrays the areas associated with the endogenous mesolimbic system and how they are connected.

**Figure 3**

*The Mesolimbic Reward System*




*Note.* The ventral tegmental area (VTA) contains dopamine producing cells. Dopamine is shuttled to the nucleus accumbens (NAc) where feelings of pleasure and well-being are produced. The prefrontal cortex (PFC) is the neurotransmitter feedback hub which communicates with the VTA to either upregulate or downregulate production of dopamine depending on stimulus. The locus coeruleus (LC) is involved in chemical dependence and will be explained later in further detail. These illustrated areas are housed within the midbrain regions of the hippocampus and thalamus. From "The Neurobiology of Opioid Dependence: Implications for Treatment," by Kosten, T., & George, T. (2002). *Science & Practice Perspectives, 1*(1), p. 13-20. doi:10.1151/spp021113. In the public domain.

Kosten & George (2002) further explain that the PFC naturally creates a negative feedback loop with the VTA to cease dopamine production when there is excess opioid receptor stimulation. As a result, this homeostatic process enables one's conscious ability to refrain from perpetuating the urge to seek pleasure "through actions that may be unsafe or unwise" (Kosten & George, 2002; para. 14). However, when exogenous opioid misuse occurs, an over-surge of dopamine interrupts the PFC-VTA-feedback loop rendering it nonfunctional which is apparent in individuals who develop a chemical addiction.

Dopamine is heavily involved in regulating movement, motivation, attention, learning, focus, executive functions, and emotions including pleasure and well-being (Kosten & George, 2002). Homeostatic modulation of dopamine is essentially what drives the human body's most simple goal-directed and reward-motivated behaviors such as appetite, sleep, cognition, and sexual reproduction. Additionally, dopamine plays a role, to some extent, in mediation of heart rate, kidney function, blood vessel function, and lactation (Kosten & George, 2002). Endorphins, as mentioned earlier in this chapter, also have neurostimulatory effects in this process, but these neuropeptides are released in appropriate amounts and function in healthier processes by not overstimulating opioid receptors to create an overproduction of dopamine and thus shutting down the PFC-VTA-feedback loop (Chahl, 1996; Kosten & George, 2002).

Conversely, dysregulation of the endogenous reward system occurs when opioid tolerance develops into a chemically dependent state such as the physical necessity of daily opioid use to avoid distressing withdrawal symptoms (Kosten & George, 2002). The pathology of this drug dependence lies in the dysfunction of synergistic neural

circuits in various locations of the CNS (Chahl, 1996; Savage et al., 2008). In the brainstem, the LC is the primary location associated with the release of the neurotransmitter norepinephrine (NE) (Kosten & George, 2002). In general, NE is responsible for regulatory operations such as arousal, alertness, attention/focus, respiration, and blood pressure (Savage et al., 2008). When individuals experience withdrawal symptoms to opioids, NE becomes involved as a primary culprit (Savage et al., 2008). "Opioid withdrawal is one of the most powerful factors driving opioid dependence and addictive behaviors" (Kosten & George, 2002, para. 8).

Opioids not only activate the VTA, but they also activate the LC resulting in suppression of NE release. When suppression of NE release occurs for extended periods, the result is the manifestation of symptoms such as hypotension (low blood pressure), bradypnea (reduced breathing), bradycardia (reduced heart rate), and drowsiness (Kosten & George, 2002). In instances of opioid overabundance in the mesolimbic system and LC, excessive suppression of blood pressure and respiration can cause death – common occurrence of opioid overdose whether intentional or not (Kosten & George, 2002; Savage et al., 2008).

Upon reaching the imperceptible juncture of opioid tolerance, or when opioid intake is temporarily ceased, the inadequate μ receptor stimulation, or the complete absence thereof, suppresses the LC. This results in a surge of NE to flood the CNS and PNS causing jitters, muscle cramps, diarrhea, confusion, delirium, and anxiety (Kosten & George, 2002). Reduction in opioid quantity also affects the individual's dopamine release which rapidly diminishes euphoric effects and negatively impacts and dysregulates other life-sustaining, goal-directed behaviors – appetite, sleep, motivation,

cognition, etc. (Hyman & Malenka, 2001; Kosten & George, 2002). Consequently, psychological withdrawal symptoms such as distress, irritability, restlessness, anxiety, and depression all develop alongside physical withdrawal symptoms – muscle cramps, nausea, vomiting (Hyman & Malenka, 2001). With prolonged, repetitive use combined with intermittent cycles of withdrawal, this syndrome of physiologic and psychologic impairment chemically shifts the wiring in the VTA and thalamus into survival mode creating insatiable cravings, and a compulsive urge to reinstate the original stimulus. At this point, the compulsivity and insatiable cravings become more than one can control, mentally and physically, resulting in a state far beyond dependence. Eventually, this process evolves into a physical and psychological state of imperative need for the substance in order to function normally; thus, chemical addiction is created (Hyman & Malenka, 2001). Kosten & George (2002) go on to explain that:

> ...the pleasure derived from opioids' activation of the brain's natural reward system promotes continued drug use during the initial stages of opioid addiction. Subsequently, repeated exposure to opioid drugs induces the brain mechanisms of dependence, which leads to daily drug use to avert the unpleasant symptoms of drug withdrawal. Further prolonged use produces more long-lasting changes in the brain that may underlie the compulsive drug-seeking behavior and related adverse consequences that are the hallmarks of addiction (para. 13).

**Classes of Common Pharmacologic Opioids**

Prescription opioids, also called pharmacologic opioids or narcotics (a legal term denoting illicit opioids), are categorized by different classes based on purity (Evans, 2004). Opium alkaloids, chemical compounds extracted from seeds of the opium poppy

plant *(Papaver Somniferum),* are the chemical derivatives of what we know today as pharmacologic opioids (Evans, 2004). Morphine and codeine are considered the naturally occurring exogenous compounds that are termed opiates. Prescription opioids, on the other hand, are not naturally occurring, but rather formulated and enhanced compounds classified as semi-synthetic or fully synthetic opioids (Chahl, 1996).

Morphine has become the standard baseline measurement for proper dosing comparisons and illustrates the relative strength of various opioid medications. Morphine Milligram Equivalents (MME) is considered the standard value based on potency (CDC, 2017). MME values are a method for differentiating the common opioids in order to assess how each are implicated in opioid-related overdose occurrences. The most common prescription opioids with associated trade names listed in MME potency – least to most potent – respectively, are as follows: meperidine (Demerol), tramadol (Ultram), hydrocodone (Hysingla, Zohydro), hydrocodone & acetaminophen (Lorcet, Lortab, Norco, Vicodin), oxycodone (Roxicodone, OxyContin, Oxecta,), oxycodone & acetaminophen (Percocet, Endocet, Roxicet), oxycodone & naloxone (Targiniq), diamorphine (Heroin), methadone (Dolophine, Methadose), hydromorphone (Dilaudid, Exalgo), buprenorphine (Subutex), and fentanyl (Actiq, Duragesic, Fentora) (Von Korff et al., 2008; The Royal College of Anaesthetists, 2018; CDC, 2017).

**Opioid Prescribing Trends**

Over the past 12 years, CDC has reported the overall number of opioid prescriptions and MME dosages are in decline in the United States (Hoots & Seth, 2018). Specifically, since 2006 the rates of opioid prescriptions have decreased from 72.4 per 100 persons to 58.5 per 100 persons in 2017 (Hoots & Seth, 2018). Similarly,

since 2006 opioid MME doses greater than or equal to 90 have declined from 11.5 per 100 persons to 5.0 per 100 persons in 2017 (Hoots & Seth, 2018). However, while the overall number of opioid prescriptions and MME dosages have declined since 2006, the number of opioid prescriptions has risen for prescriptions longer than 30 days (Hoots & Seth, 2018). This signifies that medical providers are prescribing opioids for patients for longer periods of time. Rates of prescribing these longer courses of opioids have increased from 17.6 to 24.6 per 100 persons from 2006 to 2017. The data does show, however, that the 2017 estimate of 14.6 is down from its peak in 2015 (Hoots & Seth, 2018). The average length of an opioid prescription has steadily increased from 13.3 days in 2006 to 18.3 days in 2018 and this year to year increase does not appear to be slowing (Hoots & Seth, 2018). In response to longer opioid prescription course lengths, the rate of opioid prescriptions of less than 30 days have steadily decreased from 54.7 to 33.9 per 100 persons between 2006-2017 (Hoots & Seth, 2018). These findings suggest that while overall rates of opioid prescriptions are declining, individuals who are being prescribed opioids are taking them for longer durations, resulting in an increased risk of potential long-term use.

While there has been a drop in the overall rate of opioid prescriptions in recent years, the 2017 national rate of opioid prescriptions was still very high (58.5 prescriptions per 100 persons), with some areas of the United States varying greatly from the national average (Hoots & Seth, 2018). Specifically, in Alabama (107.2), Arkansas (105.4), Tennessee (94.4), Mississippi (92.9), and Louisiana (89.5), the rates of opioid prescriptions per 100 persons are markedly higher than the 2017 national average, including the 2006 national average of 72.4 per 100 persons (Hoots & Seth, 2018). This

data suggests a larger concern for opioid prescription misuse and abuse. Furthermore, a similar trend is visible in opioid MME dosages of greater than or equal to 90 for Delaware (11.0), Utah (8.4), Alaska (8.3), Vermont (8.1), and New Hampshire (8.0), which demonstrate the highest rates per 100 persons, well above the national average of 5.0 MME (Hoots & Seth, 2018). This data portrays clearly the opioid epidemic and its continued effects across large segments of this country.

To further identify the factors influencing long-term opioid use, CDC analyzed patient chart data to investigate any associations (Shah et al., 2017). In studying retrospective patient chart reviews, three associations appeared. Doses of greater than 700 MME, receiving a third opioid prescription, and opioid use longer than 10-30 days showed the greatest likelihood to have prolonged opioid use (Shah et al., 2017). Shah et al. (2017) found 70% of patients were prescribed an opioid regimen for less than or equal to seven days, and seven percent for longer than 31 days. Furthermore, the data reported by Shah et al. (2017), also demonstrated two escalation points at both six- and 31-day prescription lengths, displaying spikes in increased likelihood of continued use after each time point. These findings support the 2016 CDC guidelines on opioid use, which recommend prescribing the shortest course of opioid as possible, with less than seven days as the goal and less than three days as an ideal length of treatment (Dowell et al., 2016).

Moreover, research has suggested that MME amounts prescribed also influence potential long-term opioid use, both in total and daily equivalents (Shah et al., 2017). As previously stated, Shah et al. (2017) found a prescription total of 700 MME posed a high probability of continued long-term use, while Martin et al. (2011) found a MME daily

dose greater than 120 MME was associated with opioid use for longer than 90 days. These findings support CDC recommendations that MME dosages should be less than 50 MME as often as possible (Dowell et al., 2016). Providing healthcare providers with adequate training on appropriate dosages and prescription lengths may aid in combating the on-going opioid crisis and reduce the risk of long-term opioid use.

**Overdose Deaths**

As the opioid epidemic has proliferated across the country a consistent rise in overdose deaths has occurred. The incidence of opioid overdoses from any opioid has doubled from 2010 (6.6 per 100,000 persons) to 2016 (13.3 per 100,000 person) (Hedegaard et al., 2017) seeing the starkest increase since 2013 (7.9 per 100,000 persons). The two opioids most commonly used in opioid-related overdose deaths, and which have been driving the recent increase in incidence, are fentanyl (synthetic opioids) and heroin (Hoots & Seth, 2018). From 2006 to 2013, overdose deaths from synthetic opioids (fentanyl and tramadol) remained statistically unchanged (0.9 per 100,000 persons in 1999 to 1.0 per 100,000 persons in 2013); then from 2013 to 2016 synthetic opioid death jumped by an average of 88% per year (Hoots & Seth, 2018; Hedegaard et al., 2017). In a single year, from 2015 to 2016, rates of overdose deaths from synthetic opioids had a two-fold increase from 3.1 to 6.2 per 100,000 persons (Hoots & Seth, 2018; Hedegaard et al., 2017). Overdose deaths from heroin have increased from 1.9 per 100,000 persons in 2012 to 4.9 per 100,000 persons in 2016 (Hedegaard et al., 2017). These statistics highlight the importance of healthcare providers being knowledgeable and confident in safe opioid prescribing to prevent long-term use, abuse, addiction, and potential overdose.

## Opioid Guidelines

Evidence has shown that substantial risk is involved with treating chronic and acute pain with opioid medications (Dowell et al., 2016). In 2016, CDC released guidelines for healthcare providers on initiating, selecting, dosing, and assessing risks of opioid prescribing to inform healthcare providers on safe and evidence-based opioid prescribing (Dowell et al., 2016).

### *Prescribing*

Initially, when deciding if an opioid prescription is indicated for chronic pain, a healthcare provider should assess if prior pain management attempts with non-opioid therapy were used and if they failed to provide pain relief (Dowell et al., 2016). The type, duration, and dose are very important factors when prescribing opioids. CDC recommends an immediate-release opioid rather than an extended-release medication (Dowell et al., 2016). Initial opioid prescriptions should also be the lowest dose that is effective (Dowell et al., 2016). Prescriptions exceeding 50 MME per day should be carefully scrutinized and prescriptions exceeding 90 MME per day should be rare and have substantial reasoning to back up its use (Dowell et al., 2016). If opioids are prescribed for acute pain, they should be kept to as low of a dose as possible, prescribed as immediate-release opioids, and opioid therapy should not last longer than seven days, with three days being ideal treatment duration (Dowell et al., 2016). If opioid therapy has progressed to durations longer than the acute phase, between one week and four weeks, healthcare providers should discuss the risks and benefits again with patients (Dowell et

al., 2016). A risk-benefit discussion should be repeated again if opioid therapy continues past three months (Dowell et al., 2016).

Healthcare providers should also assess the patient for risk factors that may predispose the patient to potential opioid abuse (Dowell et al., 2016). These risk factors can include current benzodiazepine use, need for higher doses, or substance abuse history (Dowell et al., 2016). Moreover, healthcare providers might consider naloxone prescriptions for higher risk patients (Dowell et al., 2016). Naloxone has shown to reverse the inhibition of respiratory drive that develops during an opioid overdose (Chou et al., 2017). Prior to starting treatment, healthcare providers need to search for the patients via state prescription drug monitoring programs to determine if they have any other opioid prescriptions elsewhere or are currently on medications that might be harmful while on opioids (Dowell et al., 2016). Additionally, healthcare providers should also be prepared to offer medical treatment for opioid use disorder (buprenorphine or methadone) when indicated (Dowell et al., 2016). Finally, it is recommended that healthcare providers use their discretion in assessing the need for urine drug screening to determine proper opioid prescription use and/or if there exists illicit drug use on a case-by-case basis (Dowell et al., 2016).

***Patient Education***

As with all medications or treatments, the risks and benefits of opioid use should be thoroughly addressed and explained in detail to the patient prior to initiating treatment (Dowell et al., 2016). Healthcare providers have a duty to the patient to have shared-decision making discussions while reviewing the patient's goals in terms of pain management and functionality while on opioid therapy (Dowell et al., 2016). The

patient's goals should be written into a treatment plan with inclusion of the when and how of opioid therapy discontinuation, whether the pain management goals have been met, and/or whether the risk of continued use outweighs the benefits (Dowell et al., 2016). If opioid therapy is determined to be indicated for protracted use, the healthcare provider should schedule office visits at regular intervals, to again discuss the risks and benefits of continuing opioid use (Dowell et al., 2016). This guidance to maintain a continuous dialog between healthcare providers and patients is to ensure safe and effective management of opioid treatment.

**Opioid Knowledge, Confidence, Concern**

Healthcare providers' knowledge of opioid prescribing practices is key to reducing preventable opioid abuse. Multiple studies have surveyed healthcare providers' confidence in prescribing opioids, and consistently reveal that the majority of healthcare providers report diminished confidence in or felt unprepared to prescribe opioids for chronic pain (Darer et al., 2004; Jamison et al., 2014; Pearson et al., 2017; Pohler & Nowak, 2017). A study by Pearson et al. (2017) found that 60.8% healthcare providers responded negatively to being asked if they felt confident to manage chronic pain patients. While confidence was low, a majority (55.1%), of the same respondents reported having a concern for opioid addiction in their patients (Pearson et al., 2017). This demonstrates the perceived importance healthcare providers have of proper opioid management despite a lack of knowledge. One important finding reported by Pearson et al. (2017) noted that when healthcare providers reported following an opioid clinical practice guideline it correlated with increased confidence. Clinical practice guidelines are recommendations developed for healthcare providers based on the best available

evidence (i.e., CDC opioid guidelines) that better direct patient care (Shekelle, 2018). While the aforementioned surveys have explored healthcare providers' confidence, it is unclear the knowledge, confidence, and concern PAs possess when prescribing opioids.

In research presented at the annual American Academy of Physician Assistants (AAPA) conference in 2017, Pohler & Nowak (2017) found that when asking practicing PAs how they felt their training prepared them for identifying opioid abuse and the evaluation and management of pain, they responded with average scores of 2.89 and 2.99 respectively on a five-point Likert scale (Pohler & Nowak, 2017). PA students also reported that their education did not prepare them to evaluate and manage pain (3.20 out of 5) or to identify opioid abuse (2.89 out of 5) (Pohler & Nowak, 2017). This reported lack of confidence and feeling that their training did not prepare them, demonstrates the need for further education and training for PAs and PA students.

**Conclusion**

The medical treatment process for controlling pain via opioid medications is a common therapy that involves substantial risk (Hoots & Seth, 2018; Chahl, 1996; Shah et al., 2017). One aspect that might be contributing to long-term opioid use and abuse is healthcare provider prescribing habits (Shah et al., 2017). Healthcare providers have consistently reported lacking the knowledge and confidence to manage chronic pain or identify opioid abuse, including PAs (Darer et al., 2004; Pearson et al., 2017; Pohler & Nowak, 2017). Healthcare providers who do report higher confidence levels were more likely to use clinical practice guidelines to direct patient care (Pearson et al., 2017). Therefore, CDC opioid prescribing guidelines might be an effective tool to improve education and confidence in PA students.

The following chapter will include methodology of this research study. The research questions will be restated along with identifying the study population and description of the pre- and post-assessment instrument with some of the included questions. The study design and procedures will be thoroughly described to allow for the methods to be repeated. Lastly, a discussion of the validity and reliability of the pre- and post-assessment instrument, how the data will be analyzed, and the anticipated limitations will also be included in the next chapter.

# Chapter 3: Methodology

## Introduction

The purpose of this study was to evaluate the levels of knowledge, confidence, and concern of Bethel University PA 2020 cohort with respect to opioid prescribing methods and strategies for the medical treatment and clinical management of pain. There is insufficient research concerning PA student's knowledge, confidence, and concern in the matter of prescribing opioids. Therefore, this research study investigated and analyzed the following research questions:

1. How is PA student knowledge increased following completion of the CDC opioid prescribing module training?
2. How is PA student opioid prescribing confidence increased following the completion of the CDC opioid prescribing module training?
3. How is PA student concern affected with respect to opioid prescribing before and after completion of the CDC opioid prescribing module training?

The remainder of this chapter will address the study population, instrumentation, procedures, validity and reliability, data analysis, limitations, and conclusion.

## Study Population

The participant population of this research study included a convenience sample of 28 members of the Bethel University PA program 2020 cohort. The two primary researchers, who were also members of the Bethel University PA program 2020 class, were excluded from the study. Permission to utilize the selected participants stated above and proceed with the research study was granted by PA professor, Cindy Goetz PA-C

(Appendix A). Bethel University Level 3 Institutional Review Board (IRB) approval of the research study was granted by Wallace Boeve, EdD, PA-C, Bethel University PA program director (Appendix D).

**Instrumentation**

This study utilized a pre- and post-assessment evaluation created by the researchers, which contained a total of 17 multiple choice questions to assess opioid prescribing knowledge and two questions with a 10-point Likert scale (0 - indicates no confidence or concern; 5 indicates average confidence or concern; 10 - indicates complete confidence/significant concern) evaluating the levels of confidence and concern, individually, when prescribing opioids (Appendix C). A higher score on the confidence scale indicated greater confidence in prescribing opioids. A higher score on the concern scale indicated greater concern with prescribing opioids. The 17 multiple choice questions to assess knowledge levels were developed based on nine of 12 modules of CDC's opioid prescribing training – Applying CDC's Guidelines for Prescribing Opioids: An Online Training Series for Providers – found on CDC's website (CDC's guidelines for prescribing opioids, 2017). The opioid topics evaluated in the assessment evaluations are non-pharmacological treatment of chronic pain, opioid side effects, patient-rated outcome measures, patient follow-up care, opioid-use disorder, opioid-use disorder risk factors, overdose risk factors, MME, tapering opioids, benzodiazepines, prescription drug monitoring programs, urine drug testing, and medical assisted treatment. Both the pre- and post-assessment evaluations were identical and created through the testing platform, eMedley (https://he.emedley.com).

**Procedure**

This is a descriptive quantitative study involving evaluation via pre- and post-assessment evaluations of opioid prescribing knowledge for chronic pain and levels of confidence and concern in prescribing opioids. Study participants completed the pre-assessment evaluation during the initial months of the clinical year after completion of their didactic education to establish baseline opioid prescribing knowledge, level of confidence, and level of concern. Following the pre-assessment evaluation, participants completed nine of the eleven modules of the CDC opioid prescribing training – Applying CDC's Guidelines for Prescribing Opioids: An Online Training Series for Providers. Two of the 11 modules were omitted from this research study due to the content existing outside the scope of purpose of this research. During the implementation of this study, CDC created a 12th module pertaining specifically to nurse practitioners. That module was as not included in the research study. After completion of the CDC opioid prescribing module training, participants completed a post-assessment evaluation to assess opioid prescribing knowledge, confidence, and concern. The pre- and post-assessment evaluations were distributed electronically via the Bethel University PA program eMedley website as part of PA Professional Practice Capstone completed in the fall semester of 2019. Informed consent (Appendix B) was provided to each of the participants prior to the pre- and post-assessment evaluations. Additionally, each participant was given the option to decline consent of their responses to both the pre- and post-assessment evaluations being included in the study. All contact for the participants to perform the assessments came from Cindy Goetz PA-C, instructor for the PA Professional Practice Capstone course and Lisa Naser PA-C, Research Coordinator.

Pre-assessment evaluation, CDC opioid prescribing module training, and post-assessment evaluation were assigned to the participants to be completed during two-week blocks. The completion schedule commenced as outlined in Table 1.

**Table 1**

*CDC Module Schedule for PA Professional Practice Capstone*

| Weeks | Modules & Assessments | Assignment |
|---|---|---|
| 1 – 2 | Pre-assessment evaluation on eMedley Available 8/19/19; closed 8/30/19 | Complete pre-assessment evaluation (due 8/30/19) |
| 3 – 4 | 1. Addressing the Opioid Epidemic: Recommendations from CDC | Submit completion screenshot (due 9/13/19) |
| 5 – 6 | 2. Treating Chronic Pain Without Opioids<br>3. Communicating with Patients | Submit completion screenshot (due 9/27/19) |
| 7 – 8 | 4. Reducing the Risks of Opioids<br>5. Addressing Opioid Use Disorder | Submit completion screenshot (due 10/11/19) |
| 9 – 10 | 6. Dosing & Titration of Opioids: How much, How Long; How & When to Stop<br>7. Determining Whether to Initiate Opioids for Chronic Pain | Submit completion screenshot (due 10/25/19) |
| 11 – 12 | 9. Opioid Use & Pregnancy<br>10. Motivational Interviewing | Submit completion screenshot (due 11/8/19) |
| 13 | Post-assessment evaluation on eMedley Available 11/11/19; closed 11/22/19 | Complete post-assessment evaluation (due 11/22/19) |

*Note.* The first module was assigned for completion during the third and fourth weeks of fall 2019 semester and then two modules were subsequently assigned to be completed in two-week blocks.

The participants had the capability to work in advance and complete the modules at their own pace ahead of the assigned time frame. The pre-assessment evaluation was required to be completed by the participants during the time period 8/19/2019 to 8/30/2019, and completion of the post-assessment evaluation was required between the period 11/11/2019 to 11/22/2019. Participant pre- and post-assessment evaluation data was de-identified by Bethel University PA program Research Coordinator, Lisa Naser PA-C. The electronic de-identified data was then given to the researchers for data analysis and was then uploaded into IBM analytics software, SPSS, listing each participant's de-identified pre- and post-assessment evaluation results. This data was then stored on both the researchers' password protected computers for the duration of data collection and analysis. Upon completion of the study, all electronic data pertaining to the participants involved in the research was purged from the researchers' computers and stored on an external storage device locked in the PA program office for a minimum of five years, per securing requirements for Bethel University's PA Program.

**Validity and Reliability**

The researchers that executed this study created the questions for the pre- and post-assessment evaluations. In order to assess the content quality and readability of the questions found on the pre- and post-assessment evaluation, the questions were sent to and appraised by an expert review panel consisting of a medical doctor specializing in addiction medicine, two PA pain clinic providers, and a Bethel University PA faculty member. The pre- and post-assessment evaluation was revised accordingly to the advice and feedback given by the expert panel. The modifications consisted of amending grammatical errors and dosage inconsistencies. One expert disagreed with the question

regarding birth defects; however, the researchers elected to not omit this question as it was obtained and adapted from a specific self-learning assessment included in the CDC's opioid training modules.

In addition to the individuals above, a pilot group of 12 recent graduates of the Bethel University PA program completed the knowledge assessment to determine the quality of the assessment questions. Item statistics of the knowledge questions were evaluated and analyzed. Refer to Table 2.

**Table 2**

*Opioid PA Graduate Quality Assessment Item Analysis*

| Question No. | Correct Group Response | | | Point Biserial |
|---|---|---|---|---|
| | Total | Upper 27% | Lower 27% | |
| 1 | 100.00% | 100.00% | 100.00% | 0 |
| 2 | 58.33% | 66.67% | 0.00% | 0.26 |
| 3 | 16.67% | 66.67% | 0.00% | 0.53 |
| 4 | 100.00% | 100.00% | 100.00% | 0 |
| 5 | 100.00% | 100.00% | 100.00% | 0 |
| 6 | 75.00% | 66.67% | 66.67% | 0.34 |
| 7 | 91.67% | 100.00% | 100.00% | 0.18 |
| 8 | 100.00% | 100.00% | 100.00% | 0 |
| 9 | 75.00% | 100.00% | 66.67% | 0.34 |
| 10 | 33.33% | 66.67% | 0.00% | 0.71 |
| 11 | 100.00% | 100.00% | 100.00% | 0 |
| 12 | 91.67% | 100.00% | 100.00% | 0.18 |
| 13 | 100.00% | 100.00% | 100.00% | 0 |
| 14 | 100.00% | 100.00% | 100.00% | 0 |
| 15 | 91.67% | 100.00% | 100.00% | -0.25 |
| 16 | 91.67% | 100.00% | 66.67% | 0.18 |
| 17 | 58.33% | 66.67% | 33.33% | 0.5 |

*Note.* The reliability coefficient (KR20) of the assessment was 0.16. The highest score was 17/17 and the lowest score was 12/17 with the median of 13.50 and mean of 13.83.

No changes to the assessment evaluation were made to the assessment knowledge questions based on the point biserial given the small sample size. This quality assessment group of graduate PA students also did not complete the CDC opioid prescribing training.

The validity and reliability of the instrument utilized in this study was not established prior to data collection.

**Data Analysis**

Following data collection, the researchers analyzed the data using SPSS (SPSS INC. Version 25). The independent variable was CDC's opioid prescribing module training – Applying CDC's Guidelines for Prescribing Opioids: An Online Training Series for Providers – at two time points (pre-assessment and post-assessment). The dependent variables were opioid prescribing knowledge score, confidence level for prescribing opioids, and level of concern for prescribing opioids. Each dependent variable was analyzed using independent paired *t*-tests with a significance level set at $p < 0.05$.

**Limitations**

The limitations of this research included a small and narrow participant population, the potential for a learning effect, and the lack of a validated assessment instrument. This study only sampled 28 members of the 2020 Bethel University PA program cohort, which is not representative of all current PA students. Therefore, the results had a limited ability to be generalized across the broader population of PA students besides the 2020 Bethel University PA program cohort. Additionally, since the pre- and post-assessment evaluations were taken within a short time span there leaves the

possibility for a learning effect. Finally, the researchers used a self-developed instrument to determine knowledge based on beliefs of what would be essential PA opioid prescribing knowledge for a graduating PA student or PA student taking the physician assistant national certification exam (PANCE). Utilizing an unvalidated instrument to evaluate knowledge limits the ability to detect and determine clinically and statistically meaningful change.

**Conclusion**

This methodology allowed for assessment of the baseline opioid prescribing knowledge, confidence, and concern of the Bethel University PA 2020 cohort following completion of didactic education and after completion of CDC's opioid prescribing module training. With this research, there are opportunities to assess how current PA program curriculums prepare students to appropriately prescribe opioids. The following chapters will review the results of the assessment, statistical analysis, and discussion of the results. Furthermore, the following chapters will discuss the potential future research opportunities associated with this research.

# Chapter 4: Results

## Introduction

This chapter comprehensively includes and reviews the results and analysis of data collected from pre- and post-assessments. The researchers utilized a self-developed pre- and post-assessment evaluation (Appendix C) with the intent to determine how knowledge, confidence, and concern for the prescribing of opioids in Bethel PA students after utilizing CDC's opioid prescribing modules. The intention of this chapter was to gather, analyze, and compare pre- and post-assessment scores from each dependent variable – knowledge, confidence, and concern.

## Participants

There were a total of 28 Bethel University PA students from the class of 2020 who initially participated in the pre- and post-assessment evaluations. In order to be eligible, participants had to complete the pre-assessment evaluation between 8/19/2019 and 8/30/2019 and the post-assessment evaluation between 11/11/19 and 11/22/19. One participant failed to complete the pre-assessment evaluation within the required pre-test time frame. At the participant's request, the pre-assessment evaluation was made available again in the eMedley testing platform after 8/30/2019 by the research coordinator, and the participant completed the pre-assessment evaluation one day later. Another participant failed to complete the post-assessment evaluation even with the time frame for completion for this participant was extended by one week; therefore, the pre-assessment evaluation result of this participant was removed and not included in the final analysis. Thus, the pre- and post-assessment evaluations of 27 out of 28 Bethel University PA students were used in this study.

## Data Analysis

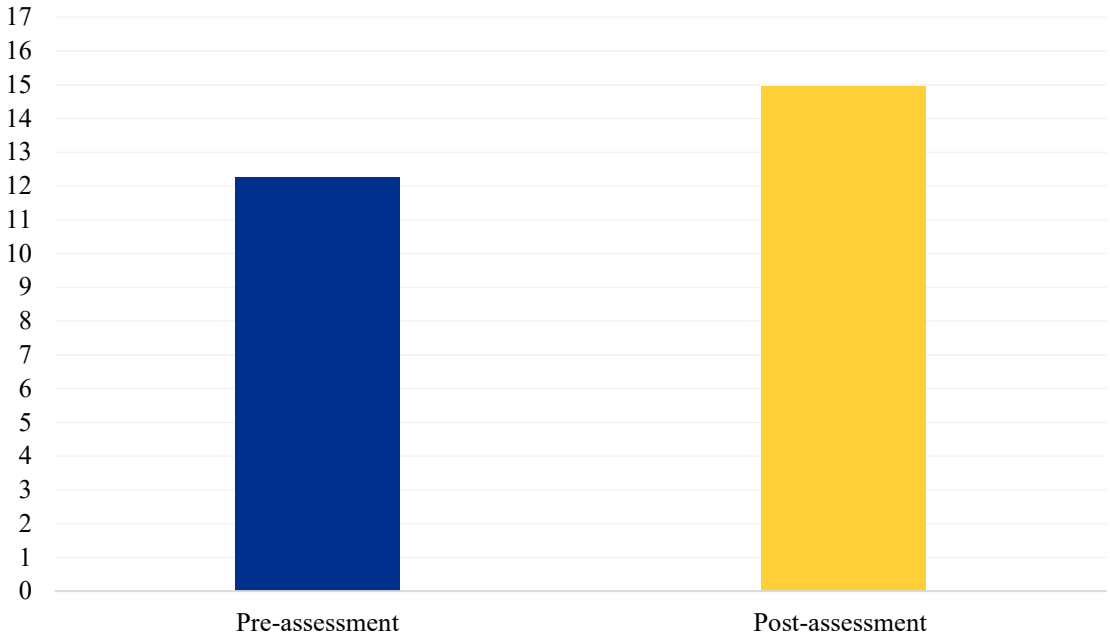
Independent paired *t*-tests were conducted on each of the dependent variables: knowledge score, level of confidence, and level of concern to compare the pre- and post-results of the pre- and post-assessment evaluations completed by each of the participants. Significance level was set at $p < 0.05$. For all unexpurgated data of the pre- and post-assessment evaluations, including SPSS output data, refer to Appendix E.

### *Knowledge Score*

The average pre-assessment evaluation score was 12.26 ± 2.25 out of 17, with the average post-assessment evaluation score of 14.96 ± 1.58 out of 17. Participants percent correct for pre-assessment scores was 72.11% ± 13.21, and the post-assessment percent score was 88.02% ± 9.30. There was a statistically significant improvement between the pre- and post-assessment evaluation scores $t(26) = 6.55$, $p = 0.00$. Knowledge scores of the pre- and post-assessment evaluation are represented in Figure 4.

**Figure 4**

*Knowledge Scores (averages) of Pre- and Post-Assessment Evaluations of CDC Opioid Training of PA Students.*




***Level of Confidence***

Participants reported a pre-assessment confidence level of 3.70 ± 2.00 out of 10, and a post-assessment confidence level of 5.89 ± 1.42 out of 10. There was a significant increase in confidence level on prescribing opioids between the pre- and post-assessment, $t(26) = 4.73$, $p = 0.00$, which indicates the participants gained more confidence with prescribing opioids.

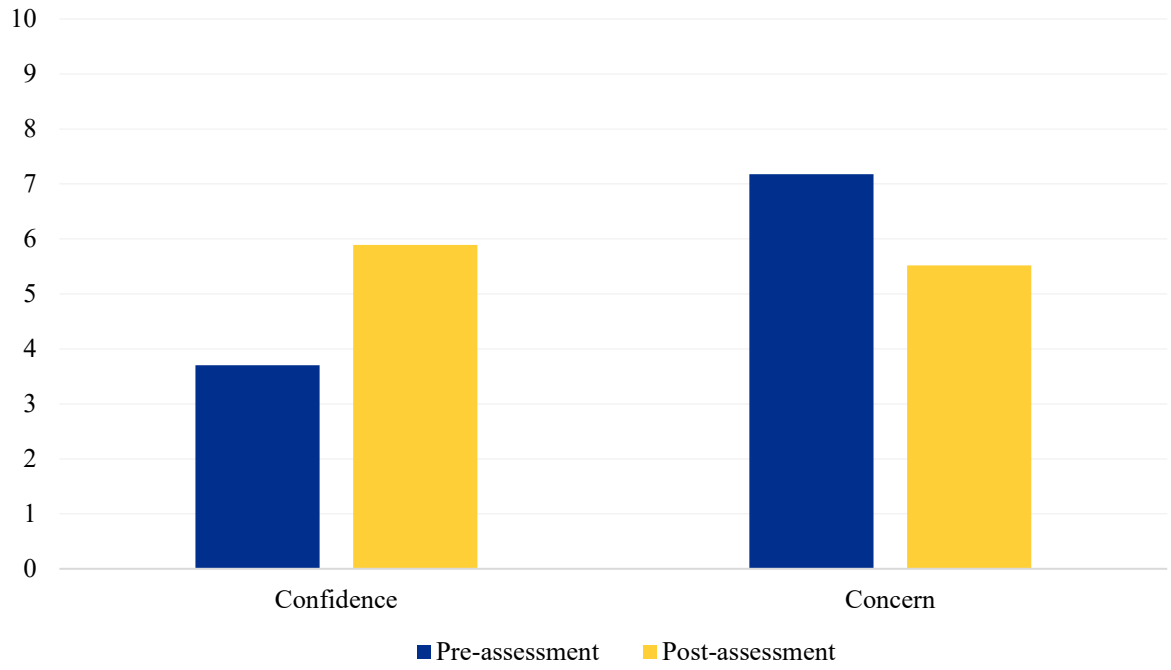
***Level of Concern***

Participants reported a pre-assessment concern with prescribing opioids of 7.18 ± 1.9 out of 10 and a post-assessment concern with prescribing opioids of 5.52 ± 1.78 out of 10. There was a significant decrease in the level of concern with prescribing opioids

from pre- to post-assessment, $t(26) = -4.60$, $p = 0.00$. This indicates that participants reported less concern with prescribing opioids following CDC's opioid prescribing modules. Figure 5 illustrates the levels of confidence and concern.

**Figure 5**

*Confidence and Concern Levels of PA Students Before and After Completing CDC Opioid Training.*




## Conclusion

The primary aim of this research project was to assess if completing CDC's opioid prescribing training modules – Applying CDC's Guidelines for Prescribing Opioids: An Online Training Series for Providers – improved knowledge and had an effect on the level of confidence or concern of Bethel University PA students when prescribing opioids. The study results demonstrate that through knowledge improvement, an increase in confidence and a decrease for concern, the modules likely created a

statistically significant result among Bethel PA student participants. Further investigation with a larger sample size would be recommended to determine validity of conclusions through use of a larger sample population. A thorough overview and comprehensive discussion of the findings in this chapter, as well as implications and recommendation for future research will continue in chapter five.

# Chapter 5: Discussion

## Introduction

This final chapter comprises a discussion of the results, interpretation, implications, limitations, and conclusions of the research study conducted regarding how knowledge, confidence, and concern for the prescribing of opioids in Bethel PA students is affected after completing CDC's opioid prescribing training modules. This chapter will elaborate on what the findings in this research study might mean for PA education moving forward, particularly how the study's findings could potentially influence PAs practicing and prescribing opioids. Moreover, factors such as population size, lack of diversity, and study design will be addressed. Finally, this chapter will also extrapolate practical actions and recommendations for exploring further research.

## Discussion of Findings

The objective of this study was to assess if CDC's opioid prescribing training modules improved knowledge, increased level of confidence, or had an effect on level of concern when prescribing opioids. The study results suggest that CDC's opioid prescribing training modules significantly improved opioid prescribing knowledge as assessed by the created pre- and post-assessment evaluations in this study. The participants scored an average of $12.26 \pm 2.25$ out of 17 on the pre-assessment evaluation and $14.96 \pm 1.58$ out of 17 on the post-assessment evaluation, which represents an increase in 2.7 correct answers or 15.9% improvement. This is an encouraging finding as healthcare providers report having a lack of knowledge in managing opioid therapy to treat chronic pain and supports the notion that CDC's opioid prescribing training modules effectively increase opioid prescribing knowledge (Darer et al, 2004, Pearson et al, 2017).

PA students, specifically, have reported feeling unprepared to manage chronic pain. From this, it further highlights the benefits that can be provided through CDC's opioid prescribing training modules, or other additional education, which then could be implemented into current, formal curriculums (Pohler & Nowak, 2017). What is unclear is how this increase in 2.7 correct answers between the pre- and post-assessment would translate to clinical practice and an improvement in clinical outcomes.

The research study data also illustrates that PA student confidence significantly increased after completion of CDC's opioid prescribing training modules. The increase went from 3.70 ± 2.00 out of 10 on the pre-assessment evaluation to 5.89 ± 1.42 out of 10 on the post-assessment evaluation. While there was an increase of 2.19, the pre- and post-assessment confidence levels were both still low on the 10-point likert scale. Additional information of confidence levels of medical providers within other specialties that also have different levels of experience would give these seemingly low confidence scores more context. Prior research has found that PA students reported low confidence levels in regard to managing chronic pain; thus, low confidence scores might be expected as students still completing their education and training are less confident overall with their medical knowledge and skills (Pohler & Nowak, 2017). Findings in prior research showed that providers who reported following a set of guidelines for opioid therapy management correlated with increased levels of confidence (Pearson, 2017). This further highlights the essential role that CDC's opioid prescribing training modules may provide since they are structured around the 2016 CDC guidelines on opioid prescribing.

Finally, the results demonstrated that PA student concern significantly decreased from 7.18 ± 1.9 to 5.52 ± 1.78 out of 10 between the pre- and post-assessments, which

represented a decrease of 1.66. This finding may indicate that when knowledge and confidence are both low, levels of concern may be high. Alternatively, as more knowledge and confidence were obtained the concern for prescribing opioids decreased. Furthermore, this finding is supported by prior research. Pearson (2017) suggested that when medical provider confidence was low, there was a correlation with increased concern about opioid prescribing.

**Limitations and Recommendations for Further Research**

Pursuing further research to expand on this study and hypotheses to include future and past Bethel University PA cohorts would be advantageous in order to evaluate any potential changes in curriculum regarding knowledge, confidence, or concern related to opioid prescribing. While this study was limited by sample size (28 Bethel University PA students), further research is recommended to include additional PA students from other PA programs in Minnesota, as well as other programs throughout the United States. This would allow for a more diverse participant pool to be obtained and for the participants to be representative of the entire cohort of PA students. With the addition of a larger sample set, future investigations may also explore study designs that include a control group versus a single or multiple experimental group so as to improve observation of correlation and differences under more strict conditions while controlling for threats of validity and minimizing possible bias, confounders, and misplaced assumptions. Additionally, it would be beneficial for the research instrument (i.e., pre- and post- assessment evaluation), to be officially validated in order to enhance the ability to detect and determine clinically and statistically meaningful change.

Furthermore, follow-up assessments of Bethel University PA students could be conducted in order to evaluate changes in knowledge, confidence, and concern as students progress into their careers and specialize in other areas of medicine. Repeat completion of the post-assessment evaluation at different future time points would give insight into how well the improvement in knowledge of the participants maintains overtime as well.

More importantly, subsequent steps with this research would be to evaluate how CDC's opioid prescribing training modules affect the habits of clinical providers when prescribing opioids, one, two, and/or five years into practice. This study data narrowly represents an academic assessment of knowledge, while the vital and fundamental assessment of healthcare is in clinical outcomes. Later research could also assess PAs before and after completing CDC's opioid prescribing training modules. Data may then be collected and analyzed for opioid prescribing practices at future time points. The potential clinically meaningful outcome hypothesis may be: Does CDC's opioid prescribing training modules change clinical practice? This research study found that knowledge and confidence improved, while concern decreased. However, the data gives no inference to the future clinical prescribing outcomes of the 28 participants involved in this study.

**Conclusions**

This research study demonstrates that when the class of 2020 Bethel University PA students completed CDC's opioid prescribing training modules there were significant increases in knowledge, confidence, and decreases in concern. This investigation also represented an initial assessment of the knowledge, confidence, and concern of Bethel PA

students following completion of their didactic education based on what the research team considered fundamental for a graduating PA student. Thus, the findings from this research may provide the Bethel University PA program with an opportunity to integrate additional training into the curriculum with the ability to also assess potential changes and improvements. These research findings also suggest that CDC's opioid training modules may increase the knowledge and confidence and decrease concern in other medical students and medical providers.

Ultimately, the key objective of current and future healthcare providers when addressing pain management in patients, should be to provide effective and safe pain treatment strategies while simultaneously minimizing the risk of opioid misuse, abuse, overdose, and possible death. Clearly, this goal is achieved primarily through appropriate opioid prescribing methods and guidelines. Therefore, CDC's opioid prescribing training modules may play an integral role in preparing PA students as they enter into practice where it is likely that responsible patient care involving the treatment and management of pain with opioid therapy will be necessary.

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# APPENDIX A

Bethel University Physician Assistant Program Approval

BETHEL
UNIVERSITY

August 19, 2019

To whom it may concern,

I give my permission for Travis Williams and Lealand Torgerson to conduct the CDC opioid training course within PHAS735 PA Professional Capstone course for the purpose of their research project. I will assist in monitoring the coursework, in addition to Professor Lisa Naser, PA-C.

Sincerely,

Cynthia Goetz, MPAS, PA-C, DFAAPA
Associate Professor
Bethel University PA Program

# APPENDIX B

Informed Consent

**Opioid Knowledge, Confidence, and Concern Research Informed Consent**

The United States has a significant health concern regarding the use of opioids. As future medical providers, it is important to learn about the clinical applications and appropriate prescribing practices of opioids; including benefits and risks. Centers for Disease Control and Prevention (CDC) has published guidelines for prescribing opioids for chronic pain. These guidelines are presented in 12 online training modules. Bethel University Physician Assistant program faculty have decided that the training provided by CDC are an excellent way to learn more about the use and prescribing guidelines for opioids. This material is incorporated into the course PHAS735 – Physician Assistant Professional Practice Capstone.

For this assignment, you will take a pre-assessment evaluation found on the testing platform, eMedley. You will then complete each of the assigned modules within the specified timeframe as outlined by the course's instructor. Upon completion of the modules, you will complete a post-assessment evaluation. All test scores will be recorded from eMedley to Moodle by the instructor of the course.

We, Travis Williams and Lealand Torgerson, are investigating the knowledge, confidence levels, and concern of prescribing practices of opioids before and after completing CDC's opioid prescribing training modules. We hope to learn how knowledge, confidence levels, and concern change before and after completion of CDC's opioid prescribing training modules.

You were selected as a possible participant in this study because you are required to complete CDC's opioid prescribing training modules as a part of PHAS735 PA Professional Practice Capstone during the fall semester of 2019.

Participation in this research involves allowing your pre- and post- assessment evaluation scores to be used by the researchers for data analysis. You will complete the pre-assessment evaluation, nine of 12 CDC opioid prescribing training modules, and the post-assessment evaluation as required by the course instructor. If you choose to allow your scores to be utilized for this research, your pre- and post-assessment evaluation scores will be deidentified by the course instructor, and the researchers will receive a database with scores listed in a randomized order. There will be no way for the researchers to link you to your exam scores and your confidentiality will be maintained. The researchers will not be able to access your scores within the testing platform; only the course instructor will have this capability. No one will be identified or identifiable in any written reports or publications. Only aggregate data will be presented.

Your decision whether or not to participate will not affect your future relations with Bethel University PA program, faculty, or cohort in anyway. If you decide to allow your scores to be utilized and then change your decision, you may contact the course instructor at any time prior to the close of the study's data collection to withdraw from the study.

This research project has been reviewed and approved in accordance with Bethel University's Levels of Review for Research with Humans. If you have any questions about the research and/or research participants' rights or wish to report a research related injury, please contact:

Lealand Torgerson PA-S, Researcher, l-torgerson@bethel.edu

Travis Williams PA-S, Researcher, travis-williams@bethel.edu

Lisa Naser PA-C, Research Chair, l-naser@bethel.edu

By selecting “Yes” below, you are providing your consent for your anonymous responses to be utilized for this research study. Completing course activity is mandatory but allowing the use of your data or inclusion into this research project is your choice. You may withdraw your permission for the researchers to use your pre- and post-assessment evaluation scores at any time prior to the close of the studies data collection. Choosing to not allow your data to be used in future publications will not affect your current or future relations with Bethel University PA program in anyway.

I agree to allow my pre-assessment and post-assessment scores to be used for this research study.

A. No, I do not allow my pre-assessment and post-assessment scores to be used for this research study.
B. Yes, I allow my pre-assessment and post-assessment score to be used for this research study.

# APPENDIX C

Pre- and Post-Assessment Evaluation

## Opioid Pre- and Post-Assessment Evaluation

**Scenario #1**

Joe is a 29-year-old male who presents to the family practice clinic requesting pain relief. For the last six weeks, Joe has had 6/10 pain located along the width of his low back, just superior to his pelvis. He denies any injury or trauma; he thinks that he hurt his back shoveling snow. He has been using heat alternating with ice and ibuprofen 800 mg TID with minimal relief. Joe denies any radicular symptoms and bowel/bladder changes. He denies any fever, chills, or weight loss. He is up to date on his preventive health care needs. He has not had any back surgeries. He does not use tobacco, alcohol, or recreational drugs.

On physical exam, he has reduced ROM with flexion and extension. He has full strength of the lower extremity bilaterally. He has no deficits in sensation to the lower extremity bilaterally. Patellar and Achilles tendon reflexes are 2+ bilaterally. Negative straight leg raise.

Joe works for a company in the shipping department and he does a lot of bending, lifting, and twisting. He is having trouble performing his job because of his back pain. He also has trouble finding a comfortable position to sleep in at night.

1. What is the next best treatment for Joe?
    a. Joint injection at L5-S1
    **b. Physical Therapy**
    c. Acetaminophen (Tylenol) 1,000 mg every 3 hours instead of ibuprofen
    d. Acetaminophen (Tylenol) with codeine 1 tablet at bedtime

***Post-assessment explanation****: Use non-pharmacologic and non-opioid treatments whenever possible and utilize non-pharmacologic and non-opioid first line for acute pain. Consider the use of opioid pain medication if the risk of pain outweighs the risk of the opioid medication. Acetaminophen 1,000 mg every 3 hours equals 8,000 mg per 24 hours, which is over the maximal recommended dose of acetaminophen. Use other modalities prior to initiating narcotics such as codeine. Joint injections and aspirations are great treatments for acute pain; however, this patient has MS pain and not pain stemming from his spine* (Module 1: CDC Recommendations: #1, 2, 3; Module 2).

Joe is seeing you for his follow up appointment. He reports that he has attended 6 weeks of physical therapy. He is able to do his job better, but his pain is still a 6/10 and he continues to have problems sleeping. Joe would like to try an opioid to help with sleep and to decrease his overall pain.

2. All of the following statements are true regarding the start of opioid therapy except?
    a. Consider how therapy will be discontinued if benefits do not outweigh risks.
    b. **Providers should discuss expectations of 100% pain reduction.**
    c. Providers should establish treatment goals with the patient.
    d. Opioid therapy is continued if pain reduction outweigh the medication risks.

***Post-assessment explanation****: All of the statements are consistent with the CDC's goals for chronic pain reduction and improvement in function with the use of opioids except there is rarely 100% reduction of pain. A more reasonable goal is to be able to meet*

*functional goals with a reasonable amount of pain* (Module 1: CDC Recommendations: #2, Module 3).

3. Why should a provider check the prescription drug monitoring program (PDMP)?
    a. To assess for the use of illicit substances that would increase the risk for overdose.
    b. To dismiss your patient from your practice if he/she has been receiving prescriptions from other prescribers.
    **c. To look for dangerous combinations of controlled substance prescriptions that would increase risk for overdose.**
    d. To monitor for drug diversion that you are suspicious is happening with this patient's prescriptions.

***Post-assessment explanation****: A prescription drug monitoring program (PDMP) is an electronic database specific to each state that allows clinicians and pharmacists to track controlled substance prescriptions for a patient that would put a patient at risk for serious harm including overdose. The PDMP does not help a clinician to look for illicit substances, you would need a urine drug test. It is not recommended by CDC that patients be dismissed from practices; rather, providers should use this encounter to assess for safety and prescribe naloxone. The PDMP can only tell the clinician that a prescription has been filled, not if the medication has been ingested or diverted* (Module 1: CDC Recommendations: #9, 10).

4. You decide to prescribe an opioid for Joe. Which of the following medications would you prescribe for chronic pain that has not improved his function at work with non-pharmacologic therapies?
    a. **Hydrocodone/APAP 5/325 mg 1 tablet PO BID PRN pain**
    b. Hydrocodone/APAP 10/325 mg 1 tablet PO BID PRN pain
    c. Methadone 5 mg 1 tablet PO Q 6 hours
    d. Oxycodone ER (Oxycontin)10 mg 1 tablet PO TID

***Post-assessment explanation****: When first prescribing an opioid for chronic pain CDC recommends that the clinician "begin with immediate release opioids, use the lowest effective dose, evaluate benefits and harms frequently, and use strategies to mitigate risk." Oxycodone ER is a long acting opioid which would not be appropriate for a starting medication. Methadone is used for medication assisted therapy for opioid use disorder in a specialty clinic, and in some complex analgesic regimens. It is not appropriate as a starting medication. Hydrocodone/APAP is a short acting, low potency opioid (combined with acetaminophen) and you would use the lowest starting dose of 5/325 mg* (Module 1: CDC Recommendations: #4, 5, Module 7).

5. Which of the following is an expected side effect of opioid medications?
    a. Diarrhea
    b. **Drowsiness**
    c. Salivation
    d. Tachypnea

***Post-assessment explanation****: Side effects of opioids include constipation, dry mouth, nausea, vomiting, drowsiness, confusion, tolerance, sexual dysfunction. The only correct answer is drowsiness* (Module 1: CDC recommendation #8).

6. You prescribe a short acting opioid medication at its lowest dose for Joe. This is the first time your patient has taken opioids. What time frame best represents the CDC's recommended time for follow up for your patient?
    a. 5 days
    **b. 14 days**
    c. 2 months
    d. 3 months

***Post-assessment explanation****: CDC recommends that clinicians should re-evaluate the effects of short acting opioid therapy and assess risk in 1-4 weeks after prescribing the medication. There should be repeated follow up at least every 3 months with assessments of functional benefit, adverse effects (including aberrant use or diversion), and safe administration. As the dose is increased or the short acting medication is changed to a long acting opioid, the frequency of follow up is increased* (Module 1: CDC recommendation #7, Module 3).

**Scenario #2**

You are working in the emergency department and caring for Mrs. Adams, a 57-year-old female who has a non-displaced fracture of the proximal 5th metatarsal. You have put her in a posterior short leg splint and referred her to podiatry.

1. What medication would you send your patient home with for pain control?
    a. **Oxycodone/APAP 5/325; 1 po bid prn pain #14**
    b. Oxycodone/APAP 10/325; 1 po bid prn pain #10
    c. Oxycodone ER 5 mg; 2 po bid prn pain #20
    d. Oxycodone ER 10 mg; 1 po bid prn pain #20

***Post-assessment explanation****: For acute pain that is expected to last for a short period of time, CDC recommends that a short acting opioid be prescribed at its lowest effective dose for the expected time of pain due to the injury. This time period is rarely expected to be longer than 7 days. Oxycodone ER is a long acting opioid which is not appropriate for acute pain. While the oxycodone/APAP 10/500 mg has a lesser quantity, it is a higher dose. Oxycodone/APAP 5/500 mg is the lowest dose that would be expected to help with the pain and a quantity of 14 tablets with instructions to take twice a day would be a 7-day prescription* (Module 1: CDC recommendation #6).

Mrs. Adams presents to you in podiatry. Mrs. Adams is having continued pain and would like a refill of the opioid given in the ED. Mrs. Adams is currently taking Sertraline 50 mg for anxiety and uses a CPAP at night. You look up this patient on Minnesota's Prescription Data Monitoring Program (PDMP). This is the PDMP report for your patient:

| Date | Provider | Medication / Dose |
|---|---|---|
| 5/5/2019 | Dr. Bryant | Hydrocodone/APAP 5/325 mg 1 PO Q 4-6 hours PRN #14 |
| 4/21/2019 | Dr. Jones | Lorazepam 2 mg 1 PO QHS #15 |
| 4/2/2019 | Dr. Wu | Hydrocodone/APAP 5/325 mg 1 PO Q 4-6 hours PRN #14 |

| Date | Provider | Medication / Dose |
|---|---|---|
| 3/23/2019 | Dr. Jones | Lorazepam 2 mg 1 PO QHS #15 |
| 2/21/2019 | Dr. Jones | Lorazepam 2 mg 1 PO QHS #15 |
| 2/6/2019 | Dr. Wu | Hydrocodone/APAP 5/325 mg 1 PO Q 4-6 hours PRN #14 |
| 2/2/2019 | Dr. Smith | Oxycodone/APAP 5/325 mg 1 PO Q 4-6 hours PRN #30 |
| 1/22/2019 | Dr. Jones | Lorazepam 2 mg 1 PO QHS #15 |

2. What risk factor for opioid overdose would you be most concerned about in this patient?
    a. Generalized anxiety disorder
    b. Female gender
    c. Obstructive sleep apnea
    **d. Benzodiazepine use**

***Post-assessment explanation****: Risk factors identified by CDC for opioid-related harm include previous overdose, older age, medical conditions such as sleep disorders, renal/hepatic insufficiency, depression or other mental health disorders, pregnancy, alcohol or other substance use disorder, and medication concerns such as taking high doses of opioids (>50 MME/day), methadone, or concurrent benzodiazepines or other sedatives. CDC also identifies that patients who receive opioids from multiple prescribers and the combination opioids and benzodiazepines are at a higher risk of overdose. This patient's PDMP report shows she is receiving benzodiazepines with opioids and is receiving prescriptions for opioids from multiple providers. While all of the options are risk factors for opioid-related harms, the concurrent use of*

*benzodiazepines and multiple opioid prescriptions from different prescribers are the greatest risk factors for overdose* (Module 1: CDC recommendation #8, 9, Module 4).

3. The podiatrist will manage Mrs. Adams' fracture as it heals but does not feel comfortable prescribing her an opioid for pain. Mrs. Adams presents to her PCP for management of her pain. Her PCP is concerned about the inconsistent use of opioids from multiple providers. What is the next best step for Mrs. Adams' PCP to consider in managing her pain?
    a. **Ask Mrs. Adams about the opioid prescriptions from multiple providers on the PDMP.**
    b. Dismissal from the practice because of a violation of a pain contract.
    c. Order a urine drug screen to prove that she is taking the opioid and not diverting the medication.
    d. Discontinue the lorazepam as she needs the opioid for her injury.

***Post-assessment explanation****: It is never a good idea to stop benzodiazepines (lorazepam in this example) without a detailed assessment of the pattern and chronicity of use. Abrupt cessation of chronic daily benzodiazepines can result in significant risks including rebound anxiety, seizure, and death. Urine drug screens are helpful to monitor chronic opioid therapy and to evaluate for unexpected substances. Urine drug screens are often not able to tell how or how much medication the patient is taking and cannot be used to determine diversion. Violation of pain contracts can often result in dismissal from a clinician's practice. CDC believes that dismissal from a clinician's practice can overlook important opportunities for opioid education and potentially life-saving interventions such as prescription of naloxone (Narcan). Establishing goals for pain and*

*function are paramount to chronic pain management and offering a conversation about your patient's PMDP findings is a good first step* (Module 1: CDC recommendation #9, 10, 11, Module 4).

**Scenario #3**

You are seeing a new patient who has been on chronic opioid therapy for shoulder pain for the last 6 years. Mary is a 41-year-old female who has osteoarthritis in her left shoulder from overuse as a young adult. She has been taking Oxycodone 10 mg 2 PO TID for pain. Mary reports that the Oxycodone makes her head feel "fuzzy." Mary is home full-time and is able to complete her daily activities. Mary's shoulder pain causes difficulty pulling shirts over her head and styling her hair in the morning. She wants to babysit her new granddaughter, but her son is hesitant because of the oxycodone.

1. What is the CDC's recommended daily morphine milligram equivalent (MME) for an initial opioid prescription?
    a. ≤ 40 MME/day
    **b. ≤ 50 MME/day**
    c. ≤ 60 MME/day
    d. ≤ 70 MME/day

***Post-assessment explanation****: Taking ≤50MME per day minimizes risk of adverse side effects including overdose. However, there is no definitive "safe" dose. Each opioid prescription should include an assessment of the potential benefits of the medication against the potential harms (including chronic opioid therapy and associated risk of withdrawal)* (Module 1: CDC recommendation #8).

2. Mary's MME is 90 mg/day, she has symptoms from her medication, and she is not able to meet her functional goals such as fixing her hair and caring for her granddaughter. What is your next step in the treatment of Mary's pain?
    a. Discuss the idea of tolerance and switch Mary to a long acting opioid such as Oxycodone ER (Oxycontin).
    **b. Explore other non-pharmacological treatments and begin an opioid taper.**
    c. Keep Mary's medications the same and write a prescription for Naloxone (Narcan) as needed for overdose.
    d. Stop the opioid and use an anticonvulsant such as gabapentin (Neurontin) instead.

***Post-assessment explanation****: Mary's side-effects outweigh the benefits of the opioid. She does not have adequate pain control, is not meeting her functional goals, and has negative drug-related consequences despite a reasonable medication trial. In addition, Mary's MME is above the safety threshold suggested by CDC. Increasing her medication or switching her to a long acting opioid increases her risk of opioid-related harms without a reasonable expectation of benefit based on the available evidence. Maintaining Mary's pain treatment at the same level does not help her to meet her functional goals. Stopping the opioid abruptly will cause painful withdrawal symptoms. Combining non-pharmacologic and pharmacologic therapies are often more successful than pharmacologic therapies alone. Beginning an opioid taper will reduce opioid side effects and reduce the risk of overdose. Naloxone (Narcan) is recommended for people*

*who are on greater than 90 MME/day or have significant risk factors for overdose* (Module 1: CDC recommendation #11, 12).

3. What is the proper method of tapering an opioid medication?
    a. Switch to a less potent opioid and maintain dose.
    b. Reduce dose frequency 10% of the starting quality every day.
    **c. Reduce dose by 10% of the starting quantity every week/month.**
    d. Switch to extended release opioid to lengthen the time between doses.

***Post-assessment explanation****: Taper slowly by 10% of their daily opioid quantity at baseline per week, or per month if the patient has been on opioids for years. Increase visit frequency during this period to counsel people on pain expectations (i.e., pain will increase transiently as they adjust to lower exogenous opioid levels) and monitor for adverse events such as opioid overuse or illicit use if withdrawal or cravings arise. Most opioid-related harms associated with prescription opioids occur during periods of dose escalation AND de-escalation* (Module 1: CDC recommendation #11, Module 6).

4. Mary becomes confrontational at the thought of taking away pain medications. She is fearful of worsening shoulder pain and she can function fine with the dose she is taking. She has already tried physical therapy and it did not fix her shoulder. She does not understand why her son is withholding her granddaughter from her and would like you to talk to him. Which of the following statements is most helpful when addressing conflict?
    a. Your medication dose is so high that you are at risk for an overdose. Is that what you want?
    b. I don't understand why you would want to stay on this medication as it isn't helping anyway.
    c. Your physical exam is normal, as is your MRI. You don't need any narcotics at this time.
    **d. It must be scary for you to think about decreasing pain medications, as this is how you have treated your pain for so long.**

***Post-assessment explanation****: Principles of motivational interviewing include empathetic statements, helps the patient to see discrepancies between the current situation and the patient's goals, adjusts to the patient's resistance, avoids statements that would lead to arguments or confrontational behavior and supports the patient's own behavior for change. Validating the patient's experience by using empathy will avoid confrontation and encourage the patient to see how the current medication dose is not consistent with her goals. The remaining statements have the potential for increased confrontation, as they do not express empathy or encourage the patient to engage with you in open conversation* (Module 1: CDC recommendation #2, Module 3).

5. Which of the following are signs or symptoms of opioid withdrawal?
    a. Constipation
    **b. Excessive sweating**
    c. Increased appetite
    d. Pupillary constriction

***Post-assessment explanation****: Opioid withdrawal has a variety of symptoms, which includes sweating. Constipation and pupillary constriction are symptoms and signs of opioid use. Those in withdrawal have nausea and vomiting, not an increased appetite* (Module 3 & 5).

6. Medication assisted treatment (MAT) for opioid use disorder refers to the use of methadone, buprenorphine, or long-acting naltrexone. Which of the following statements is true regarding MAT?
    a. Buprenorphine must be administered by a MAT treatment center only.
    b. It is best to start a patient on Naltrexone when they are currently using opioids.
    c. Methadone has a short half-life and is considered a short acting opioid.
    ***d.*** **To prescribe Buprenorphine, the clinician must have a Buprenorphine prescribing waiver.**

***Post-assessment explanation****: Methadone is an opioid agonist that has a long half-life (24-36 hours) and has inconsistent bioavailability. Methadone must be dispensed by a licensed MAT treatment center which requires that patients present at regular intervals to receive their medication. Buprenorphine can be prescribed by any clinician who has completed a certified training course and obtained a buprenorphine waiver from the*

*DEA. Naltrexone is an opioid antagonist and will precipitate immediate withdrawal in patients who have opioid tolerance and have opioids in their system. Patients must be abstinent from opioids for 7-10 days if taking short acting opioids or 10-14 days if taking long acting opioids* (Module 5).

**Scenario #4**

Helen is a 22-year-old female G2 P0101 female who is 18 weeks pregnant. She presents to your obstetric clinic for prenatal care. She is taking methadone 70 mg daily and has been taking this for one year as a part of her substance use disorder treatment.

Her urine drug screen reveals the following results:

| Medication / Drug | Test Result | Reference Value |
|---|---|---|
| Amphetamine | Negative | Negative |
| Barbiturates | Negative | Negative |
| Benzodiazepines | Negative | Negative |
| Cocaine | Negative | Negative |
| Ethanol | Negative | Negative |
| Methadone | **Positive** | Negative |
| Phencyclidine | Negative | Negative |
| Tetrahydrocannabinol | Negative | Negative |

This is her second pregnancy. Her first pregnancy resulted in a premature boy who was removed from her custody due to Helen's active illicit substance use at the time. Helen plans to parent the child she is expecting. Her concern today is regarding the methadone's effects on her pregnancy.

1. Which of the following is a risk to the fetus when exposed to an opioid in utero?
    a. Large head circumference
    **b. Congenital heart defect**
    c. Post-term delivery
    d. Hyperglycemia

***Post-assessment explanation****: Fetal risks associated with opioid use during pregnancy to the fetus include: Growth restriction, abruptio placentae, preterm labor, arrhythmias, intrauterine passing of meconium, and fetal death. There are also birth defects reported with the use of opioids during pregnancy and these include: neural tube defects, congenital heart defects, oral clefts, clubfoot, and gastroschisis. Large head circumference and post-date delivery is the opposite of what could be expected with the use of opiates during pregnancy and there is no data that reports hyperglycemia. In the setting of an opioid use disorder, maintenance of opioid agonist therapy (methadone or buprenorphine) is strongly recommended to optimize both short-and long-term maternal and fetal outcomes. Congenital heart defects could be possible with the use of opioids during pregnancy especially with use in the first trimester* (Module 9).

2. Which of the following is the best treatment option for Helen during her pregnancy?
    a. **Continue the methadone and ensure she is receiving counseling for her substance use disorder.**
    b. Fast taper off methadone with no subsequent use of opioids as she has no chronic pain.
    c. Refuse to care for her as you are uncomfortable with the methadone and its pregnancy risks.
    d. Switch her to naloxone from methadone as naloxone is not an opioid.

***Post-assessment explanation****: The fetus and the pregnant woman taking methadone do have more risks during pregnancy. Tapering opioids during pregnancy also has risks to the fetus and pregnant woman. It is not recommended to taper chronic use opioids during pregnancy as the risk of substance disorder worsening with then inconsistent use of opioids and potential for overdose is detrimental for both fetus and patient. Naloxone is not recommended during pregnancy as there is insufficient data on its effect on the fetus. It is recommended that pregnant women continue their methadone (or buprenorphine) treatment during pregnancy along with psychosocial support* (Module 9).

**10-Point Likert-Scale Questions**

1. What is your current confidence in the prescription of opioids for the treatment of pain? (10 = complete confidence, 0 = no confidence)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **No Confidence** | | | | | **Average Confidence** | | | | | **Complete Confidence** |

2. What level of concern do you currently have in prescribing opioids for the treatment of pain? (10 = significant concern, 0 = no concern)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **No Concern** | | | | | **Average Concern** | | | | | **Significant Concern** |

**APPENDIX D**

IRB Approval

BETHEL
UNIVERSITY

## PA Program Level 3 IRB Approval

1 message

**Wallace Boeve** <w-boeve@bethel.edu> Thu, Aug 22, 2019 at 8:16 AM
To: Lealand Torgerson <l-torgerson@bethel.edu>, Travis Williams <travis-williams@bethel.edu>
Cc: Lisa Naser <l-naser@bethel.edu>, Peter Jankowski <p-jankowski@bethel.edu>

August 22, 2019

Lealand & Travis;

As granted by the Bethel University Human Subjects committee as the program director, I write this letter to you in approval of Level 3 Bethel IRB of your project entitled: "Opioid Knowledge, Confidence, and Concern of Bethel University Physician Assistant Students." This approval is good for one year from today's date. You may proceed with data collection and analysis. Please let me know if you have any questions.

Sincerely;

Wallace Boeve, EdD, PA-C
Program Director
Physician Assistant Program
Bethel University
w-boeve@bethel.edu
651 308-1398 cell
651 635-1013 office
651 635-8039 fax
http://gs.bethel.edu/academics/masters/physician-assistant

CC: Bethel IRB Chair
Faculty Chair Advisor
PA Program Research Coordinator

# APPENDIX E

SPSS Data Analysis

## Descriptives

**Notes**

| | | |
|---|---|---|
| Output Created | | 19-DEC-2019 07:53:04 |
| Comments | | |
| Input | Data | C:\Users\100353113\Dropbox\Travis\T-thesis\Travis_thesis_data_updated.sav |
| | Active Dataset | DataSet1 |
| | Filter | <none> |
| | Weight | <none> |
| | Split File | <none> |
| | N of Rows in Working Data File | 29 |
| Missing Value Handling | Definition of Missing | User defined missing values are treated as missing. |
| | Cases Used | All non-missing data are used. |
| Syntax | | DESCRIPTIVES VARIABLES=New_pre_test_score New_post_test_score Opioid_pre_test_percentage<br><br>Opioid_post_test_percentage Opioid_pre_test_confidence Opioid_post_test_confidence<br><br>Opioid_pre_test_concern Opioid_post_Test_concern<br>/STATISTICS=MEAN STDDEV MIN MAX KURTOSIS SKEWNESS. |
| Resources | Processor Time | 00:00:00.00 |
| | Elapsed Time | 00:00:00.00 |

[DataSet1] C:\Users\100353113\Dropbox\Travis\T-thesis\Travis_thesis_data_updated.sav

**Descriptive Statistics**

| | N Statistic | Minimum Statistic | Maximum Statistic | Mean Statistic | Std. Deviation Statistic | Skewness Statistic |
|---|---|---|---|---|---|---|
| New_pre_test_score | 28 | 7.00 | 16.00 | 12.2857 | 2.20869 | -.679 |
| New_post_test_score | 27 | 11.00 | 17.00 | 14.9630 | 1.58069 | -.755 |
| opioid pre test percent | 28 | 41.176 | 94.118 | 72.26891 | 12.992288 | -.679 |
| Opioid post test percentage | 27 | 64.71 | 100.00 | 88.0174 | 9.29817 | -.755 |
| Opioid pre test confidence | 29 | .00 | 10.00 | 3.6793 | 1.92824 | 1.038 |
| Opioid post test confidence | 27 | 4.00 | 9.00 | 5.8889 | 1.42325 | 1.075 |
| How concerned are you with prescribing opioid (pre-test) | 28 | 3.00 | 10.00 | 7.1071 | 1.91174 | -.198 |
| How concerned are you with prescribing opioids (post test) | 27 | 3.00 | 9.00 | 5.5185 | 1.78391 | .406 |
| Valid N (listwise) | 27 | | | | | |

**Descriptive Statistics**

| | Skewness | Kurtosis | |
|---|---|---|---|
| | Std. Error | Statistic | Std. Error |
| New_pre_test_score | .441 | .094 | .858 |
| New_post_test_score | .448 | .485 | .872 |
| opioid pre test percent | .441 | .094 | .858 |
| Opioid post test percentage | .448 | .485 | .872 |
| Opioid pre test confidence | .434 | 3.230 | .845 |
| Opioid post test confidence | .448 | -.141 | .872 |
| How concerned are you with prescribing opioid (pre-test) | .441 | -.957 | .858 |
| How concerned are you with prescribing opioids (post test) | .448 | -.646 | .872 |
| Valid N (listwise) | | | |

**T-Test**

## Notes

| | | |
|---|---|---|
| Output Created | | 19-DEC-2019 07:56:03 |
| Comments | | |
| Input | Data | C:\Users\100353113\Dropbox\Travis\T-thesis\Travis_thesis_data_updated.sav |
| | Active Dataset | DataSet1 |
| | Filter | <none> |
| | Weight | <none> |
| | Split File | <none> |
| | N of Rows in Working Data File | 29 |
| Missing Value Handling | Definition of Missing | User defined missing values are treated as missing. |
| | Cases Used | Statistics for each analysis are based on the cases with no missing or out-of-range data for any variable in the analysis. |
| Syntax | | T-TEST PAIRS= New_post_test_score Opioid_post_test_percentage<br><br>Opioid_post_test_confidence<br>Opioid_post_Test_concern WITH<br>New_pre_test_score<br>Opioid_pre_test_percentage<br>Opioid_pre_test_confidence<br><br>Opioid_pre_test_concern (PAIRED)<br>/CRITERIA=CI(.9500)<br>/MISSING=ANALYSIS. |
| Resources | Processor Time | 00:00:00.02 |
| | Elapsed Time | 00:00:00.01 |

**Paired Samples Statistics**

| | | Mean | N | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pair 1 | New_post_test_score | 14.9630 | 27 | 1.58069 | .30420 |
| | New_pre_test_score | 12.2593 | 27 | 2.24624 | .43229 |
| Pair 2 | Opioid post test percentage | 88.0174 | 27 | 9.29817 | 1.78943 |
| | opioid pre test percent | 72.11329 | 27 | 13.213163 | 2.542874 |
| Pair 3 | Opioid post test confidence | 5.8889 | 27 | 1.42325 | .27390 |
| | Opioid pre test confidence | 3.7037 | 27 | 1.99644 | .38421 |
| Pair 4 | How concerned are you with prescribing opioids (post test) | 5.5185 | 27 | 1.78391 | .34331 |
| | How concerned are you with prescribing opioid (pre-test) | 7.1852 | 27 | 1.90217 | .36607 |

**Paired Samples Correlations**

| | | N | Correlation | Sig. |
|---|---|---|---|---|
| Pair 1 | New_post_test_score & New_pre_test_score | 27 | .414 | .032 |
| Pair 2 | Opioid post test percentage & opioid pre test peroent | 27 | .414 | .032 |
| Pair 3 | Opioid post test confidence & Opioid pre test confidence | 27 | .042 | .835 |
| Pair 4 | How concerned are you with prescribing opioids (post test) & How concerned are you with prescribing opioid (pre-test) | 27 | .481 | .011 |

**Paired Samples Test**

| | | Paired Differences | | | |
|---|---|---|---|---|---|
| | | | | | 95% Confidence ... |
| | | Mean | Std. Deviation | Std. Error Mean | Lower |
| Pair 1 | New_post_test_score - New_pre_test_score | 2.70370 | 2.14503 | .41281 | 1.85516 |
| Pair 2 | Opioid post test percentage - opioid pre test percent | 15.904139 | 12.617804 | 2.428298 | 10.912702 |
| Pair 3 | Opioid post test confidence - Opioid pre test confidence | 2.18519 | 2.40252 | .46236 | 1.23478 |
| Pair 4 | How concerned are you with prescribing opioids (post test) - How concerned are you with prescribing opioid (pre-test) | -1.66667 | 1.88108 | .36201 | -2.41080 |

**Paired Samples Test**

| | | Paired ... | | | |
|---|---|---|---|---|---|
| | | 95% Confidence Interval of the ... | | | |
| | | Upper | t | df | Sig. (2-tailed) |
| Pair 1 | New_post_test_score - New_pre_test_score | 3.55225 | 6.550 | 26 | .000 |
| Pair 2 | Opioid post test percentage - opioid pre test percent | 20.895577 | 6.550 | 26 | .000 |
| Pair 3 | Opioid post test confidence - Opioid pre test confidence | 3.13559 | 4.726 | 26 | .000 |
| Pair 4 | How concerned are you with prescribing opioids (post test) - How concerned are you with prescribing opioid (pre-test) | -.92254 | -4.604 | 26 | .000 |