Benefits of a Continuing Education Module to Enhance New Jersey Primary Care Providers'

Attitudes about Recommending Medical Marijuana rather than Prescribing Opioids to Patients

with Chronic Pain

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Abstract

In the wake of the opioid epidemic, treatment options for chronic pain have become increasingly complex. The practice of treating chronic pain with opioids has led to increased risks of addiction, morbidity, and mortality in New Jersey and across the United States. With the passing of medical marijuana laws, it has become apparent the primary care providers do not feel comfortable using this treatment option for chronic pain because of the lack of available education on its use. To address this issue a study was conducted to measure primary care providers' comfort and confidence in the use of medical marijuana for chronic pain. It aimed to measure attitudes on the use of medical marijuana for chronic pain rather than opioids by providing New Jersey primary care providers with a continuing education module on the uses of medical marijuana for chronic pain. An educational module was implemented to observe an increase in attitudes toward the uses of medical marijuana for chronic pain.

Keywords: medical marijuana, cannabis, attitudes, primary care providers

Introduction

Treatment options for chronic pain in the United States have increased in complexity as a result of primary care providers beginning to follow the new Centers for Disease Control and Prevention guidelines for opioid prescriptions, which aimed to reduce prescription opioid-related overdoses (Dowell, Haegerich, & Chou, 2016). Studies have shown that patients who have legitimate opioid prescriptions from one prescriber account for 60% of opioid-related overdoses (Bachhuber, Saloner, Cunningham, & Barry, 2014). In recent years as the opioid epidemic has worsened in the United States, the considerations for and use of medical marijuana for chronic pain has increased. While more than half of the states have laws that legalize the use of medical marijuana in some capacity, it has been found that primary care providers do not feel comfortable authorizing its use, as they have yet to receive formal education and training on this practice to treat chronic pain (Sideris, Khan, Boltunova, Cuff, Gharibo, and Doan, 2018). To address this issue, a continuing education module focusing on the effectiveness of medical marijuana for chronic pain was created for primary care providers in New Jersey. This study analyzed the effectiveness of implementing a continuing education module on primary care providers' attitudes towards recommending medical marijuana rather than prescribing opioids to patients with chronic pain. The goal of this study was to increase primary care providers' confidence and comfort levels in recommending medical marijuana to chronic pain patients with the use of continuing education module. With increased understanding and comfort in the use of medical marijuana, primary care providers are more likely to recommend medical marijuana to chronic pain patients as a safer alternative to opioids.

Background & Significance

Chronic pain affects more than 100 million Americans a year and accounts for $635 billion per year in medical costs. This condition can be difficult to treat and often requires repeated medical visits, changes in lifestyle, and treatment therapies that are rarely covered by insurance companies, such as complementary approaches and cognitive behavioral therapy (Boehnke, Litinas, & Clauw, 2016). Chronic pain is defined by pain that lasts longer than the time needed for normal tissue healing, which is typically longer than 3 months. There are many factors that contribute to chronic pain such as illness, inflammation, musculoskeletal conditions, medical treatment, physical injury, underlying medical conditions, neuropathies, and even unknown causes (Dowell, Haegerich, & Chou, 2016). The most common form of treatment for chronic pain is the use of opioids, which carries numerous risks including addiction, morbidity, and mortality (Boehnke et al., 2016).

Opioids are associated with statistically significant, but small improvements in overall pain and functioning. It was found that opioids were correlated with only a small improvement in pain, functioning, and improvement of sleep compared to a placebo. Opioids also compared similarly to tricyclic antidepressants, nonsteroidal anti-inflammatory drugs, and synthetic cannabinoids in regards to improvements in physical functioning and pain. Use of opioids has also been associated with side effects such as nausea, vomiting, constipation, dizziness, drowsiness, pruritis, and dry mouth (Busse et al., 2018).

Treatments for chronic pain, which involved the use of opioid pain medication, resulted in over 165,000 deaths due to prescription overdoses from 1999 to 2014 in the United States. In addition, it was found that 1.9 million people were dependent on or abused prescription opioid analgesics in 2013. The Centers for Disease Control and Prevention's 2016 guidelines for prescribing opioids for chronic pain supply a checklist for primary care providers that

emphasizes the reduction of opioid use for chronic pain. These guidelines highlight the use of non-pharmacological and non-opioid pharmacological treatment prior to the use of opioids including measuring goals and functions of the patient; weighing the risks and benefits of prescribing opioids; using immediate release, starting with a low dose and slowly tapering up as needed; checking the prescription drug monitoring program to avoid multiple prescriptions; utilizing drug tests; avoiding concurrent benzodiazepine use; providing close follow-up; and adequately treating opioid use disorders (Dowell, Haegerich, & Chou, 2016). While these guidelines are beneficial in addressing how to reduce opioid use for chronic pain, they do not provide an alternative for patients who require high doses of opioids. Furthermore, they do not provide physicians with any guidance on how to manage chronic pain with medical marijuana for those who live in states that have some medical marijuana laws in place.

The use of opioids has created a significant clinical and economic burden throughout the United States and New Jersey. National statistics show that there was a 345% increase in opioid related deaths from 2001 to 2016, a rise from 9,489 deaths in 2001 to 42,245 deaths in 2016. In addition, it was found that the opioid-related deaths were accountable for 5.2 per 1000 in 2016 (equivalent to 1,681,351 years of life lost); death totals due to opioids surpassed those attributed to chronic diseases such as cancer, HIV/AIDs, hypertension, and pneumonia (Gomes, Tadrous, Mamdani, Paterson, & Juurlink, 2018). More recent statistics show that nearly 218,000 people have died from opioid prescription overdose from 1999-2017 in the United States, this accounts for 47,000 deaths in 2017 alone (Centers for Disease Control and Prevention, 2018). Within the United States, opioid-related healthcare costs and substance abuse treatments average approximately $28.9 billion annually, which represents roughly one-third of the total economic burden caused by the use of opioids ($78.5 billion). Included within these figures are costs

associated with fatal/non-fatal cases, lost productivity, and the criminal justice system (Florence, Zhou, Luo, & Xu, 2016).

In New Jersey, opioid related overdose deaths accounted for 22 deaths per 100,000 in 2017 compared to the national average of 14.6 deaths per 100,000. In 2017, the deaths related to prescription opioids almost doubled since 2014 from 273 deaths to 490 deaths (National Institute on Drug Abuse, 2019). There was also an increase in opioid-related emergency room visits in New Jersey, increasing from 507 per 100,000 in 2008, to 1,338 per 100,000 visits in 2016. Furthermore, the inpatient stays in New Jersey rose from 961 per 100,000 stays in 2008 to 1,361 per 100,000 stays in 2016. New Jersey was one of the highest rated states with opioid-related hospital use compared to the rest of the Unites States in 2016 (Agency for Healthcare Research and Quality, 2018). The clinical and economic burden of prescribing opioids warrants a need to explore alternative options for the treatment of chronic pain.

The recommendation and use of medical marijuana has garnered increased attention, along with increased controversy, throughout the United States within the last two decades. State medical marijuana laws were first passed in California in 1996, and since then, comparable laws were passed in 32 other states along with Puerto Rico, Guam, and the District of Columbia (National Conference of State Legislators, 2019). In 2010, New Jersey passed the "New Jersey Compassionate Use of Medical Marijuana Act," which made it the 15th state to legalize medical marijuana. The original law allowed providers to recommend medical marijuana for "debilitating medical conditions" such as epilepsy, amyotrophic lateral sclerosis, terminal cancer, multiple sclerosis, Crohn's disease, inflammatory bowel disease, intractable muscle spasticity, muscular dystrophy, glaucoma, and a terminal illness with a prognosis of less than one year of life (New Jersey Compassionate Use Medical Marijuana Act, 2010). This law was later amended in 2018

to include the diagnoses of anxiety, chronic pain of visceral origin, migraines, and Tourette's syndrome (State of New Jersey Department of Health, 2019).

Many studies show a reduction in the use of opioid analgesics in the states, which have enacted medical marijuana laws. In a study completed by Bachhuber, Saloner, Cunningham, and Barry, 2014, it was found that there was an annual decreased average of 24.8% opioid-related overdoses in states that passed medical marijuana laws. Furthermore, this decrease persisted the longer the laws remained enacted in each state (Bachhuber et al., 2014). Medical marijuana was also used as an alternative for many drugs including opioids to reduce pain, improve sleep, improve appetite, and reduce anxiety. It was found to be an alternative to prescription medications, because the onset of medical marijuana was quicker, had less side effects, was better at managing symptoms, reduced potential harm, and had longer lasting effects on pain. Medical marijuana was also used by some individuals to taper off their opioid prescriptions in order to improve pain and decrease potential risks (Bruce, Brady, Foster, & Shattell, 2018). Lastly, the use of medical marijuana was associated with improved quality of life by decreasing medication side effects felt by opioids in chronic pain patients (Boehnke et al., 2016).

With an increasing number of patients who suffer from chronic pain, coupled with the potential risks associated with opioid analgesics, education on the use of alternative options for treating chronic pain became a priority. In this study, primary care providers received detailed education on the use of medical marijuana for chronic pain in order to make informed decisions and have educated discussions with patients who may be candidates. With its therapeutic benefits, it can provide chronic pain patients with an alternative to opioid analgesics, which can overall help to reduce the economic and clinical burden of opioid prescriptions. New Jersey passed the New Jersey Compassionate Use of Medical Marijuana Act in 2010, therefore, it was

important for providers to receive formal education on its use so patients who can benefit from it

can be educated on this alternative form of pain relief. This study was important to determine if

providing this education to primary care providers changed their attitudes towards the use of

medical marijuana for chronic pain.

Needs Assessment

While medical marijuana laws are quickly being passed across the United States, the need

to educate primary care providers on its use for chronic pain was a state and local issue. This

treatment option could not be addressed nationally as laws supporting its use have not been

enacted on a federal level. While 33 states in the United States have medical marijuana laws, the

extents to which these laws cover the use of medical marijuana differ, and therefore, continuing

education needed to be tailored to comply with state laws. For example, each state determines

the conditions that qualify a patient to receive medical marijuana. As a result, trainings should be

altered to educate primary care providers on the unique qualifiers specific to the state in which

they practice (National Conference of State Legislators, 2019). In a recent study conducted at

████████████, Philpot, Ebbert, and Hurt, 2019, found that the majority of primary care

providers thought that medical marijuana is useful in treating conditions such as intractable pain,

cancer, and terminal illness, but about 50% of the providers did not want to or were not prepared

to answer patients' questions about medical marijuana. It was found that a majority of these

physicians wanted to learn more about medical marijuana. This study concluded that it is

important to close the knowledge gap for primary care providers by providing information on the

effectiveness of medical marijuana for state qualifying conditions (Philpot, Ebbert, & Hurt,

2019).

In Colorado, Washington, and New York, all states with legalized medical marijuana laws, healthcare professionals that were provided minimal education demonstrated lower comfort levels associated with recommending medical marijuana. Sideris, Khan, Boltunova, Cuff, Gharibo, and Doan, 2018, found that while most of the physicians who completed their survey supported medical marijuana, few participants who were registered to prescribe marijuana had adequate knowledge of its use. The study concluded that this observation was likely to be the case with practitioners in other states (Sideris et al., 2018). In Colorado, it was discovered that most family physicians (~92%) agreed that there should be formal training requirements prior to being granted the ability to recommend marijuana (Kondrad & Reid, 2013). In the state of Washington, it was found that although many providers saw the importance of medical marijuana, few felt comfortable in recommending it to patients because of inadequate training on its use. This study found that patients who could benefit from the use of medical marijuana may not have this option because of the lack of their providers' confidence levels in recommending it (Carlini, Garrett, & Carter, 2017). Lastly, in Delaware, it was found that the providers who were more knowledgeable about medical marijuana felt more comfortable with recommending it to their patients (Rapp, Michalec, & Whittle, 2015).

While there are no studies like these for the state of New Jersey, Sideris, Khan, Boltunova, Cuff, Gharibo, and Doan, 2018, state that practitioners in other states are likely to experience the same lack of adequate knowledge on the uses of medical marijuana. New Jersey passed its medical marijuana laws in 2010 and recently ammended the laws to include more qualifying conditions. The State of New Jersey Department of Health states that while the NJ Medical Marijuana Program does not offer any specific medical education courses, it is recommended that providers maintain adequate knowledge on the areas of pain management and

addiction. The NJ Medical Marijuana Program offers 20 articles on medical marijuana research for medical professionals with the most recent dated in 2013 (State of New Jersey Department of Health, 2019). Based on these findings, a continuing education module was needed to address the use of medical marijuana for new and old chronic pain conditions for primary care providers to enhance their attitudes on its use.

Problem/Purpose Statement

Chronic pain is a condition that over 100 million Americans suffer from across the United States. While there is a push to reduce the number of opioids being prescribed, this condition is still largely treated with opioid analgesics which present numerous life-threatening risks. The clinical and economic costs of opioid analgesics are tremendous across the United States, and New Jersey is among the states with the highest use and abuse. It is important that alternative treatment options to opioid analgesics for chronic pain are considered by New Jersey primary care providers. While medical marijuana has been proven to be a safer alternative to prescription opioids for chronic pain, it is not widely used due to the lack of education on its use, which leads to lower comfort levels in the practice amongst healthcare professionals. To address this problem, a continuing education module on the use of medical marijuana for chronic pain was created for provided to primary care providers in New Jersey.

The purpose of this study was to analyze a change in New Jersey primary care providers' attitudes towards recommending medical marijuana rather than prescribing opioids for chronic pain after reviewing a continuing education module.

Clinical Question

Did presenting New Jersey primary care providers with a continuing education module on the use of medical marijuana for chronic pain enhance their attitudes of recommending medical marijuana rather than prescribing opioids to patients with chronic pain?

Aims and Objectives

The aim of this study was to enhance New Jersey primary care providers' attitudes on recommending medical marijuana for chronic pain rather than prescribing opioids, when appropriate. The following objectives/tasks were developed and met to monitor the progress and results of the study:

1. Develop a continuing education module that will provide education and evidence, found through variable databases, on the use and benefits of medical marijuana for chronic pain patients.

2. Create a pre-test and post-test using a likert scale to assess changes in attitudes on recommending medical marijuana prior to completing the module and after completing the module.

3. Distribute the continuing education module, pretest, and posttest to primary care providers in New Jersey.

4. Based on the results from the pre-test and post-test, assess measurable attitudes such as comfort levels and positive perceptions of medical marijuana use for chronic pain.

Review of Literature

A review of literature was conducted to obtain evidence in order to address the three primary aspects of the evidence-based practice question. The searches focused on primary care providers' attitudes on the uses of medical marijuana for chronic pain treatment, on the uses of continuing education to enhance positive attitudes on medical marijuana, and on the effects of

medical marijuana on chronic pain. Various sources were utilized to search for relevant information including CINAHL, Ovid, and PubMed. The initial search, which included key terms such as "Medical Marijuana" OR "Cannabis" OR "CBD" OR "Medical Cannabis" AND "Chronic Pain" OR "Pain," yielded 3,156 results. The results were further narrowed down to only include literature within the past five years, full text, scholarly/peer-reviewed, and English language. Based on the preceding process, a total of nine articles were obtained. An additional search was done in CINAHL applying key terms such as "Continuing Medical Education" OR "Continuing Education" OR "Professional Development" AND "Attitude" which yielded 17,105 results. The search was further narrowed down with the terms "Medical Marijuana" OR "Cannabis" OR "CBD" OR "Medical Cannabis." This search was filtered with the same criteria applied to the first search to obtain three more articles. This search process was limited due to the novelty of this practice; however, it was found through a search of gray literature that there are numerous online modules that address the uses of medical marijuana. After an in-depth analysis of the literature, nine research articles and three non-research articles were chosen. All of the chosen references were meticulously assessed with the John's Hopkins evidence appraisal tool to determine the level of evidence.

Research Articles

Of the nine research articles obtained, three are systematic reviews, three are quasi-experimental studies, two are longitudinal studies, and one is a non-experimental study. One study was rated high quality and the remaining eight were rated good quality evidence. Based on the appraisals, one study was level I, five studies were level II, and three studies were level III evidence. While a majority of the research articles addressed the use of medical marijuana for chronic pain, two studies assessed the effects of medical marijuana laws on the prescriptions of

opioids in states that had implemented them compared to the states without medical marijuana laws, two studies addressed how education affects knowledge, attitude, and self- efficacy, one study addressed primary care providers attitudes and comfort in recommending medical marijuana, and one study determined its effects on quality of life.

Non-Research Articles

Out of the three non-research articles, two are literature reviews and one is a consensus and position statement. One study was rated high quality evidence and the remaining two were of good quality evidence. Based on the appraisals, the good quality study was level IV evidence and the remaining two good quality studies were level V evidence. The two literature review articles addressed the uses of medical marijuana for chronic pain and the consensus and position statement provided an evidence-based educational tool for Canadian providers to increase their comfort in recommending medical marijuana.

Synthesis of Evidence

All of these studies collectively reaffirmed the evidence behind medical marijuana and how it could be used in an education module to increase primary care providers' comfort in its use rather than opioids for chronic pain. Whereas a majority of the studies took place within the United States, one study occurred in Jerusalem and Canada each (longitudinal study and the Consensus and Position Statement, respectively). Several of the studies stated the need to further educate healthcare professionals on the uses of marijuana and almost all of the studies stated that there is a need for further high-quality research on the uses of medical marijuana. A majority of these studies were limited by a small sample size, short trial durations, inconsistencies in the route of medical marijuana administration, differences in the content of THC and CBD, and subjective responses (see Appendix A).

In a non-experimental study done at ███████████ in 2019, it was found that about 50% of primary care providers were not prepared or did not want to answer patients' questions about medical marijuana. Only a few of the physicians in this study believed that medical marijuana improved quality of life and more than 1/3 of these physicians believed that medical marijuana interacted with other medical therapies. While a majority of these physicians believed that medical marijuana was effective in managing certain conditions, they did not have enough knowledge on its uses and effects to feel comfortable recommending it to patients. As a result of many physicians/participants in this study requesting additional information on the uses of medical marijuana, the authors of the study suggested closing the knowledge gap by providing information on the effectiveness of medical marijuana for state qualifying conditions (Philpot, Ebbert, & Hurt, 2019). Mouhamed, Vishnyakov, Qorri, Sambi, Frank, Nowierski, Lamba, Bhatti, & Szewczuk, 2018, found that physicians in Canada were uncomfortable authorizing medical marijuana due to the lack of education surrounding the subject. As a result, they created an educational tool that provides evidence-based analysis on the therapeutic uses of medical marijuana (Mouhamed et al., 2018).

In a study done by Williams, Kessler, and Williams, 2015, it was found that continuing medical education significantly affected knowledge acquisition and retention. For example, the study noted a strong relationship between knowledge acquisition, motivation to change, and self-efficacy measure. This study found that it is important to address a participant's self-efficacy when creating a continuing medical education module to yield a change in practice (Williams, Kessler, & Williams, 2015). In another study conducted at a large national hospice and palliative care program across 16 states, it was found that an online module was effective in educating providers on medical marijuana. This study found that educational intervention did not change

attitudes towards medical marijuana as attitudes remained positive before and after the intervention. However, the implementation of this online educational module showed a significant increase in knowledge and self-perceived skills among hospice providers (Mendoza & McPherson, 2018). In order to develop an effective continuing education module that can have a positive impact on primary care providers' attitude on medical marijuana usage, it was important to consider all of these components.

To further support the question of presenting primary care providers with a continuing education module, "high" and "good" quality evidence was gathered to create a continuing education module. High quality level I evidence showed that there is moderate quality evidence to prove that medical marijuana is beneficial for chronic, neuropathic, and cancer related pain (Whiting et al., 2015). Further appraisal of good quality evidence showed that there is moderate to high quality evidence that proves the effectiveness of medical marijuana for chronic pain (Aviram & Samuelly-Leichtag, 2017). As for neuropathic pain, good quality level III evidence showed that there is low strength evidence to prove that cannabis may alleviate neuropathic pain (Nugent et al., 2017), but good quality level V evidence to prove that medical marijuana is comparable to current medical therapies for neuropathic pain (Lee, Grovey, Furnish, & Wallace, 2018). Additional good quality level II evidence showed that medical marijuana is associated with a significant improvement in pain, pain related quality of life, and physical function along with a reduction in opioid use (Haroutounian et al., 2016). A majority of the evidence identified side effects, contraindications, and precautions to take with the use of medical marijuana, all factors which were considered in the development of the continuing education module.

Along with the uses of medical marijuana for chronic pain, primary care providers received background information on the mechanism of action of medical marijuana to help them

better understand uses, interactions, and contraindications. There was high quality level IV

evidence that explained the mechanism of action of medical marijuana, its use in certain

conditions, and policies and guidelines used to help Canadian physicians make the appropriate

decisions about recommending medical marijuana (Mouhamed et al., 2018). Another good

quality level V study discussed the use of medical marijuana for cancer pain and further

explained the mechanisms of actions in the body and its potential synergistic effects with the use

of opioids that can ultimately lead to a decrease in pain and opioid use (Abrams & Guzman,

2015). Lastly, a good quality level II study found that states that have implemented medical

marijuana laws were associated with a 5.88% lower rate of Medicaid covered prescriptions for

all opioids and states with the implementation of adult use medical laws were linked with an

additional 6.38% lower opioid prescription rate. Collectively, implementation of these laws were

associated with a 8.69% lower rate of non-opioid pain medication prescriptions (Wen &

Hockenberry, 2018). Furthermore, in the states that had medical marijuana laws between 1999 to

2000, there was an average of 24.8% lower annual rate of opioid overdose deaths than states

without medical marijuana laws (Bachhuber, Saloner, Cunningham, & Barry, 2014). This

evidence was beneficial and important to include when educating primary care providers on the

uses of medical marijuana for chronic pain rather than prescription opioids.

Based on the synthesis of evidence, it was found that primary care providers needed more

education on the uses of medical marijuana. As stated in the evidence, education modules are

useful in improving knowledge, self- efficacy, and motivation to change. To further answer this

clinical question, an education module based on good quality evidence was created to further

educate on the uses of medical marijuana for chronic pain rather than opioids. This allowed for

better evaluation for changes in attitudes in primary care providers.

Theoretical Framework

The framework that best fit this project was the knowledge-to-action process conceptual framework (see Appendix B). This framework was created to apply knowledge creation and knowledge application by a wide-range of stakeholders, such as clinicians, patients, policymaker, and the general public. In this framework, new knowledge is first processed and synthesized, followed by the creation of a new tool to present the new knowledge to those with the ability to benefit from and apply the information. After the tool is created, the knowledge is applied through the action cycle which involves identifying the problem, adopting the knowledge into a local context, assessing the difficulties to use the knowledge, implementing the interventions to enhance knowledge use, monitoring use of knowledge, evaluating the outcomes, and maintaining use of knowledge (White, Dudley-Brown, & Terhaar, 2016).

In this project, knowledge creation was based on the uses of medical marijuana for chronic pain. Knowledge was gained through searched evidence on CINAHL, OVID, and PubMed, and was further processed and synthesized to develop a continuing education module on the uses of medical marijuana for chronic pain. This project identified the problem that primary care providers lack knowledge on the uses of medical marijuana for chronic pain which leads to decreased comfort in the use of medical marijuana. Education on the uses of medical marijuana for chronic pain treatment was treated on a state-by-state basis as federal laws prohibit the uses of medical marijuana and state laws differ on the legality of medical marijuana. Therefore, the continuing education module that was developed was only available to New Jersey primary care providers. This project helped to evaluate one of the main barriers to knowledge use which is that the lack of knowledge leads to decreased confidence in the use of medical marijuana; therefore, knowledge was provided through a continuing education module.

Once the continuing module was dispersed, attitudes on the use of medical marijuana were assessed prior to and after the completion of the continuing education module. This information allows for further evaluation of outcomes of knowledge use and allows for alternative measures to be taken to maintain knowledge use.

Methodology

As previously stated, medical marijuana is not a widely used alternative to opioids for the treatment of chronic pain by primary care providers because of the lack of comfort in its use. This lack of comfort is related largely to the lack of knowledge on the uses and effects of medical marijuana. Therefore, the goal of this project was to improve attitudes by providing evidence-based knowledge and assessing their changes to better understand where improvements in attitudes need to be made. The project accomplished this goal through the use of a pre/post-test designed to measure the change in primary care providers' attitudes on the uses of medical marijuana. The pre-test and post-test each contained ten identical questions as shown in Appendix C. These tests were administered at the beginning and the conclusion of the educational module.

Setting

The education module was made available to primary care nurse practitioners and nurses in New Jersey and ██████████████ nurse practitioner students. This module was available via Canvas platform ███████████████

Study Population

The continuing education module was made available to practicing nurse practitioners, nurse practitioner students, and nurses in New Jersey for two months (July- August, 2019). Since this module was made available to nurse practitioners, nurse practitioner students, and nurses in

New Jersey, the study population was obtained through convenience sampling. With this method, it was hoped that this study will recruit at least 60 participants. The eligibility criteria for this study was individuals who identify themselves in the demographics section as primary care nurse practitioners in New Jersey, nurse practitioner students in primary care tracks, or nurses. The exclusion criteria included individuals who do not identify as primary care nurse practitioners in New Jersey, nurse practitioner students, or nurses. This criterion was evaluated in the demographics section of the continuing education module, see appendix D.

Subject Recruitment

In order to recruit participants, a mass email was sent out to all current APN students, APN alumni, and APN faculty ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮. The co-investigator (CI) also handed out flyers to APN students after their classes one week prior to the intervention period. Both the email and the flyer contained the same information as shown in Appendix E. The emails were sent out once a week for three weeks prior to and weekly during the intervention period.

Consent Procedures

Consent was obtained at the beginning of the continuing education module. Participants were asked to read the consent form and asked in quiz format "By beginning this research, I acknowledge that I am 18 years of age or older and have read and understand the information. I agree to take part in the research, with the knowledge that I am free to withdraw my participation in the research without penalty. Do you agree to participate in this study?" Participants who selected agree were able to continue the module and those who select disagree were not be able to complete the module. See Appendix F for consent form.

Benefits/Risks

This study was beneficial to the study participants and their patients in many ways. Participants benefited in the sense that they obtain new knowledge on the uses of medical marijuana which, as a result of the added knowledge, gave them confidence in using marijuana for treatment options for their patients. The module also gave them the confidence to have evidence-based discussions with their patients who may inquire about the use of medical marijuana. Long-term benefits of this study include a potential decrease in opioid prescriptions and opioid-related overdoses in New Jersey with the increased use of medical marijuana for chronic pain. The module created for this study can also potentially benefit providers and patients in other states if made available to them in the future. Lastly, they had an added benefit of obtaining CE credits for completing the module. There were minimal risks to the participants in this study; however, participants may have felt uncomfortable with the material presented and uncomfortable with the knowledge that they had on medical marijuana. Overall, the benefits of having participated in this study outweighed the risks.

Subject Costs and Compensations

Participants were provided this module free of cost and were not compensated for their participation in the study.

Study Intervention

The intervention of this study was to provide an online continuing education module to primary care providers regarding the uses of medical marijuana as a treatment option for patients who experience chronic pain. The continuing education module contained the following information:

1. The Burden of Opioid use for Chronic Pain
   o Chronic Pain

- Chronic pain is defined by pain that lasts longer than the time needed for normal tissue healing, which is typically longer than 3 months.
    - Causes: illness, inflammation, musculoskeletal conditions, medical treatment, physical injury, underlying medical conditions, neuropathies, and unknown causes (Dowell, Haegerich, & Chou, 2016)
- Chronic pain affects more than 100 million Americans a year
    - Accounts for $635 billion per year in medical costs (Boehnke, Litinas, & Clauw, 2016)

o Opioids

- Most common form of treatment for chronic pain is opioids
    - Risks of this treatment option include addiction, morbidity, and mortality (Boehnke et al., 2016)
- Associated with statistically significant, but small improvements in overall pain and functioning.
- Produce only a small improvement in pain, functioning, and sleep compared to a placebo
- Compare similarly to tricyclic antidepressants, nonsteroidal anti-inflammatory drugs, and synthetic cannabinoids in regards to improvements in physical functioning and pain (Busse et al., 2018)

o Side Effects of Opioids

- Common Side Effects:
    - Nausea

- Vomiting

- Constipation

- Dizziness

- Drowsiness,

- Pruritis

- Dry mouth (Busse et al., 2018)

o Opioid Use

  - Between 1999 to 2014, there were over 165,000 deaths due to prescription overdoses

  - 1.9 million people were dependent on or abused prescription opioid analgesics in 2013 (Dowell, Haegerich, & Chou, 2016)

  - Studies have shown that patients who have legitimate opioid prescriptions from one prescriber account for 60% of opioid-related overdoses (Bachhuber, Saloner, Cunningham, & Barry, 2014)

o CDC Guidelines

  - The Centers for Disease Control and Prevention's 2016 guidelines for prescribing opioids for chronic pain supply a checklist for primary care providers that emphasizes the reduction of opioid use for chronic pain (Dowell, Haegerich, & Chou, 2016)

  - These guidelines are beneficial in addressing how to reduce opioid use for chronic pain, but they do not provide an alternative for patients who require high doses of opioids

- They do not provide practitioners with any guidance on how to manage chronic pain with medical marijuana for those who live in states that have some medical marijuana laws in place

o Clinical Burden of Opioid Use in the United States

- National statistics show that there was a 345% increase in opioid related deaths from 2001 to 2016

    - A rise from 9,489 deaths in 2001 to 42,245 deaths in 2016

- Opioid-related deaths were accountable for 5.2 per 1000 in 2016

    - Equivalent to 1,681,351 years of life lost

    - Surpassed the deaths attributed to chronic diseases such as cancer, HIV/AIDs, hypertension, and pneumonia (Gomes, Tadrous, Mamdani, Paterson, & Juurlink, 2018)

- Nearly 218,000 people have died from opioid prescription overdose from 1999-2017 in the United States

    - 47,000 deaths in 2017 alone

- On average 130 people die from opioid overdose every day in the United States

o Clinical Burden of Opioid Use in New Jersey

- Opioid related overdose deaths accounted for 22 deaths per 100,000 in 2017 compared to the national average of 14.6 deaths per 100,000

- In 2017, the deaths related to prescription opioids almost doubled since 2014 from 273 deaths to 490 deaths (National Institute on Drug Abuse, 2019)

- o Hospital Visits

    - ▪ Hospital Visits in 2016

        - • Increase in opioid-related emergency room visits from 507 per 100,000 in 2008, to 1,338 per 100,000 visits in 2016

        - • Inpatient stays in New Jersey rose from 961 per 100,000 stays in 2008 to 1,361 per 100,000 stays in 2016

        - • New Jersey was one of the highest rated states with opioid-related hospital use compared to the rest of the Unites States in 2016 (Agency for Healthcare Research and Quality, 2018)

- o Economic Burden of Opioid Use

    - ▪ Opioid-related healthcare costs and substance abuse treatments average approximately $28.9 billion annually

        - • Roughly one-third of the total economic burden is caused by the use of opioids ($78.5 billion)

        - • Also accounts for costs associated with fatal/non-fatal cases, lost productivity, and the criminal justice system (Florence, Zhou, Luo, & Xu, 2016)

2. Introduction to Medical Marijuana

    - o History of Medical Marijuana in the United States

        - ▪ State medical marijuana laws were first passed in California in 1996

            - • Since then similar laws were passed in 32 other states along with Puerto Rico, Guam, and the District of Columbia (National Conference of State Legislators, 2019)

o Medical Marijuana in New Jersey

- New Jersey passed the "New Jersey Compassionate Use of Medical

  Marijuana Act," in 2010 which made it the 15th state to legalize medical

  marijuana

  - The original law allowed providers to recommend medical

    marijuana for "debilitating medical conditions" such as epilepsy,

    amyotrophic lateral sclerosis, terminal cancer, multiple sclerosis,

    Crohn's disease, inflammatory bowel disease, intractable muscle

    spasticity, muscular dystrophy, glaucoma, and a terminal illness

    with a prognosis of less than one year of life (New Jersey

    Compassionate Use Medical Marijuana Act, 2010)

  - This law was later amended in 2018 to include the diagnoses of

    anxiety, chronic pain of visceral origin, migraines, and Tourette's

    syndrome (State of New Jersey Department of Health, 2019)

o Linking Medical Marijuana to Opioids

- It was found that there was an average of 24.8% annual decrease in

  opioid-related overdoses in states that passed medical marijuana laws

  - This decrease persisted the longer the laws remained enacted in

    each state (Bachhuber et al., 2014)

- Medical marijuana was also used as an alternative for many drugs

  including opioids to reduce pain, improve sleep, improve appetite, and

  reduce anxiety

- Used an alternative to prescription medications due to the onset of medical marijuana being quicker with longer lasting effects on pain and better at managing symptoms with less side effects

- Used by some individuals to taper off their opioid prescriptions in order to improve pain and decrease potential risks (Bruce, Brady, Foster, & Shattell, 2018)

  - Use of medical marijuana was associated with improved quality of life by decreasing medication side effects felt by opioids in chronic pain patients (Boehnke et al., 2016)

- Why More Education is Needed

  - Sideris, Khan, Boltunova, Cuff, Gharibo, and Doan, 2018, found that while most of the physicians who completed their survey supported medical marijuana, few participants who were registered to prescribe marijuana had adequate knowledge of its use

    - The study concluded that this observation was likely to be the case with practitioners in other states (Sideris et al., 2018)

  - In Colorado, it was discovered that most family physicians (~92%) agreed that there should be formal training requirements prior to being granted the ability to recommend marijuana (Kondrad & Reid, 2013)

  - In the state of Washington, it was found that although many providers saw the importance of medical marijuana, few felt comfortable in recommending it to patients because of inadequate training on its use

- This study found that patients who could benefit from the use of medical marijuana may not have this option because of the lack of their providers' confidence levels in recommending it (Carlini, Garrett, & Carter, 2017)

  - In Delaware, it was found that the providers who were more knowledgeable about medical marijuana felt more comfortable with recommending it to their patients (Rapp, Michalec, & Whittle, 2015)

  - It is important to close the knowledge gap for primary care providers by providing information on the effectiveness of medical marijuana for state qualifying conditions (Philpot, Ebbert, & Hurt, 2019)

- Education Gap in New Jersey

  - The State of New Jersey Department of Health states that while the NJ Medical Marijuana Program does not offer any specific medical education courses, it is recommended that providers maintain adequate knowledge on the areas of pain management and addiction

    - The NJ Medical Marijuana Program offers 20 articles on medical marijuana research for medical professionals with the most recent dated in 2013 (State of New Jersey Department of Health, 2019)

- How Medical Marijuana Programs Work

  - Medical Marijuana is a Schedule I Drug

    - There have been many federal bills requesting to reschedule marijuana

      - So far all of these requests have been denied

- Health care providers are not allowed to prescribe marijuana

- Instead health care providers can certify patients with a state qualifying condition that allows patients to register with the medical marijuana program in their state

  o Nurse Practitioners in New Jersey are not allowed to certify patients for medical marijuana

  o There are 8 states that allow nurse practitioners to certify patients with qualifying conditions for medical marijuana

- Patients can them obtain medical marijuana from designated dispensaries (Gowen, Cahill, Russell, & Cronquist, 2018)

o The National Council of State Boards of Nursing Guidelines for APRNs

  ▪ The guidelines for certifying a medical marijuana program qualifying condition states that APRNs should practice following when certifying a patient:

    - Have essential knowledge on the laws, the program, the endocannabinoid system, the pharmacology and the research associated with marijuana, and safety considerations for the patient

    - Have a clinical encounter and identify the qualifying condition with assessment, treatment, medication reconciliation, mental health, alcohol and substance abuse history, and ongoing monitoring and evaluation

- Have informed and shared decision-making based on scientific evidence, safety considerations, adverse effects, and individualized goals

- Document the assessment, qualifying conditions, goals of therapy, plans to monitor and adequately communicate them with other health team members

- Ethically practice without judgement to the patient and avoidance of conflicts of interest

- Identify special considerations based on the patient's needs (i.e. specific employer policies and procedure) (Gowen, Cahill, Russell, & Cronquist, 2018)

  o Important Considerations

    ▪ While New Jersey may not allow nurse practitioners to certify patients with qualifying conditions for medical marijuana, it does not mean that they should not be educated on the following:

      - Medical marijuana pharmacology and research associated with its use

      - The Endocannabinoid System

      - Scientific Evidence

      - Safety considerations and adverse effects

      - Recommendations based on research

    ▪ Nurse practitioners may be asked for more information and their opinion on whether or not this drug is appropriate for a patient

3. The Pharmacokinetics of Medical Marijuana

- o Absorption of Medical Marijuana

   - Inhalation

     - Onset of action: 5 Minutes

     - Bioavailability: 2%-56% (Mouhamed et al., 2018)

     - Peak plasma concentration: 2-10 minutes with a decline in 30 minutes (Abrams & Guzman, 2015)

     - It has a higher peak concentration with a shorter duration of action (2-4 hours) than oral cannabis (Mouhamed et al., 2018)

     - Inhalation has a less psychoactive effect than oral because less 11-OH-THC metabolite is formed (Abrams & Guzman, 2015)

   - Ingestion (Oral Cannabis)

     - Onset of action: 4-6 Hours

     - Bioavailability: 4%-22% (Mouhamed et al., 2018)

     - Peak plasma concentration: 1-6 Hours

     - Half-life- 20-30 Hours (Abrams & Guzman, 2015)

     - Compared to the inhalation route, the oral route has a slower onset of action but a longer duration of action, making it a reasonable option for chronic pain (Mouhamed et al., 2018)

   - Oral Mucosal

     - Has similar effects to oral cannabis (Mouhamed et al., 2018)

   - Distribution

     - The Endocannabinoid System

- o   Made up of two G-protein-coupled receptors (GPCRs): Cannabinoid receptors 1 and 2 (CB1 and CB2)

- o   These cannabinoid receptors are activated by endogenous endocannabinoids 2-arachidonoylglycerol (2-AG) and anandamide (AEA) (Mouhamed et al., 2018)

- o   CB1 receptors: located in the central nervous system, skeletal muscles, liver tissue, adipocytes, and gastrointestinal system

    - ▪   THC has a high affinity to CB1 receptors

- o   CB2 receptors: located on immune cells found in the bone marrow, spleen, tonsils, and thymus as well as in the enteric nervous system in the GI tract

    - ▪   CBD has a high affinity to CB2 receptors (Mouhamed et al., 2018)

- ▪   Metabolism

    - •   Metabolized in the liver by the CYP450 enzymes

        - o   Predominantly affects CYP1A2, CYP2C, CYP3A resulting in potential interactions with medications that are metabolized by these enzymes (Abrams & Guzman, 2015)

- ▪   Excretion

    - •   Once the drug is metabolized in the liver, about 97% of THC and its metabolites bind in fatty tissue or to plasma protein within organs such as the liver, brain, heart, and lungs

- 65% of the remaining drug is excreted in feces and 20% in urine

- A majority of the THC (80%-90%) can be excreted within 5 days but can be detected up to 13 days in chronic smokers

   o Studies have found that the drug can also be detected in circulation for up to one month

- In heavy users, it can be detected in the urine for up to 90 days (Mouhamed et al., 2018)

4. Cannabinoids

   o Where Does Marijuana Come From

      ▪ The Cannabis Sativa, Cannabis Indica, and Cannabis Ruderalis species produce compounds called cannabinoids that produce psychoactive and pharmacological effects (Mouhamed et al., 2018)

   o Phytocannabinoids

      ▪ Phytocannabinoids are the main active ingredients

      ▪ There are two main types:

         - Delta-9-tetrahydrocannabinol (THC)- main component that causes psychoactive effects

         - Cannabidiol (CBD)- non-psychoactive cannabinoid that mainly affects the immune system (Mouhamed et al., 2018)

   o CBD vs THC

      ▪ CBD reduces the psychoactive effects of THC by affecting the metabolism of THC and preventing the formation of its more psychoactive metabolite, 11-OH-THC

- A higher THC:CBD ratio = more psychoactive effects

- Lower THC:CBD ratio = less psychoactive effects and more

  relaxing and sedative effects (Mouhamed et al., 2018)

- o The Endocannabinoid System

  - A biological system that plays a key role in communicating physiological

    processes

  - Made up of two G-protein-coupled receptors (GPCRs): Cannabinoid

    receptors 1 and 2 (CB1 and CB2)

    - These cannabinoids receptors are activated by endogenous

      endocannabinoids 2-arachidonoylglycerol (2-AG) and anandamide

      (AEA) (Mouhamed et al., 2018)

- o Cannabinoid Receptors

  - CB1 receptors- located in the central nervous system, skeletal muscles,

    liver tissue, adipocytes, and gastrointestinal system

    - THC has a high affinity to CB1 receptors

  - CB2 receptors- located on immune cells found in the bone marrow,

    spleen, tonsils, and thymus as well as in the enteric nervous system in the

    GI tract

    - CBD has a high affinity to CB2 receptors (Mouhamed et al., 2018)

5. The Uses of Medical Marijuana for Pain

   - o The Effects of Marijuana on Pain

     - Marijuana reduces pain by inhibiting presynaptic neurotransmitter release

       and reducing postsynaptic excitability (Mouhamed et al., 2018)

- Increased CB1 receptors found in the brain modulate nociceptive processing

- CB2 receptors reduce pain through an anti-inflammatory role

  - Cannabinoids act on mast cell receptors that release inflammatory agents such as serotonin, histamines, and keratinocytes to provide pain relief (Abrams & Guzman, 2015)

o Neuropathic Pain

- There is moderate- quality evidence to prove that cannabis is beneficial in neuropathic pain (Whiting et al., 2015)

- Medical marijuana is thought to reduce chronic neuropathic pain by decreasing sensory limbic functional connectivity between the amygdala and the primary somatosensory cortex (Mouhamed et al., 2018)

- Six blinded, randomized- controlled trials (RCT) and two open label trials all concluded that using medical marijuana for neuropathic pain showed statistical significance in at least one or more measure of neuropathic pain.

  - Some participants showed a 30% reduction in pain (Mouhamed et al., 2018)

o Current Treatment for Neuropathic Pain

- A number of randomized control trials found that medical marijuana produces similar results for pain reduction to current therapies for neuropathic pain

  - Vaporization and oral mucosal delivery are tolerable and safe for treating neuropathic pain (Lee et al., 2018)

- o HIV-Related Peripheral Neuropathy
    - ▪ A RCT demonstrated that inhaled medical marijuana reduced daily neuropathic pain by 34% compared to 17% with the placebo group
    - ▪ 52% of the medical marijuana group reported a greater than 30% reduction in pain compared to 24% of the placebo group (Abrams & Guzman, 2015)
- o Marijuana for Chronic Non-Neuropathic Pain
    - ▪ There is moderate to high quality evidence that proves the effectiveness of cannabis-based medicines for the treatment of chronic pain (Aviram & Samuelly-Leichtag, 2017)
        - • Cannabis may be a safer strategy for patients who are suffering from chronic pain and are non-responsive to first line treatment
        - • Patients who used cannabinoids reported a 30% reduction in pain compared to patients who used the placebo (Whiting et al., 2015)
- o Marijuana for Certain Diseases
    - ▪ Although the overall effect of marijuana on multiple sclerosis is not proven, there are indications that it is effective in reducing pain and spasticity
    - ▪ For Parkinson's disease it is found that marijuana significantly improves pain scores just 30 minutes after smoking it
    - ▪ Medical marijuana was shown to be more effective than ibuprofen in medical overuse headaches in a small randomized, double-blinded, crossover study (Mouhamed et al., 2018)

- o Cancer-Related Pain
    - ▪ In a double-blind, placebo-controlled study, it was found that 10mg of THC produced the same analgesic effects of 60mg of codeine over 7 hours whereas 20mg of THC produced effects similar to 120mg of codeine
        - • This higher dose of THC produced more sedation than codeine (Abrams & Guzman, 2015)
    - ▪ In another study, twice as many cancer patients achieved a greater than 30% reduction in pain with a THC: CBD combination compared to the placebo group
    - ▪ An observational study concluded that 70% patients who took medical marijuana for pain reported subjective improvements in pain management (Abrams & Guzman, 2015)
- o Quality of Life
    - ▪ A prospective, open-label, single-arm longitudinal study found that not only was medical marijuana associated with a significant improvement in pain but also in pain related quality of life (Haroutounian et al., 2016)
6. Medical Marijuana in Relation to Opioids
    - o Synergism
        - ▪ It is suggested that cannabinoids and opioids may work synergistically with one another at the receptor sites
            - • While opioids are mediated through the mu-receptors, it is theorized that THC activates the delta and kappa opioid receptors and is responsible for releasing endogenous opioids.

- With the use of medical marijuana, opioids can be decreased and the patient can obtain the same amount of pain relief (Abrams & Guzman, 2015)

o Reduction of Opioids with Medical Marijuana

   - A prospective, open-label, single-arm longitudinal study found that there was a 44% reduction in the use of opioids in patients who were treated for chronic pain with medical marijuana

      - 32 of the 73 patients using opioids discontinued them at follow up

      - The median morphine equivalent dose for those who were still using opioids at follow up decreased from 60mg to 45mg (Haroutounian et al., 2016)

o Safety of Opioids and Medical Marijuana

   - Cannabis has a much safer side effect profile compared to opioids

      - Opioid use increases risks for hospitalizations, endocrinopathy, cognitive decline, bowel dysfunction, increased comorbidities, overdose-related death, and increased costs

      - Cannabis receptors are not located in the brainstem which controls respiration; therefore, respiratory suppression due to overdose does not occur (Abrams & Guzman, 2015)

o Implications of Medical Marijuana Laws

   - A longitudinal study with a time-series analysis found that in the states that had medical marijuana laws at the time of the study (1999-2000),

there was an average of 24.8% lower annual rate of opioid overdose

deaths compared to states without such laws

- This finding generally strengthened with the ongoing years of

  implementation of the medical marijuana laws

- After excluding deaths by suicide and including heroin overdose

  deaths, the relationship between opioid overdose and medical

  marijuana laws was similar in that the states with medical

  marijuana laws still had a significant decrease in opioid overdoses

  (Bachhuber et al., 2014)

o Healthcare Costs with Medical Marijuana Laws

   ▪ Medical marijuana laws were associated with a 5.88% lower rate of

     Medicaid- covered prescriptions for all opioids

      - States with adult use medical marijuana laws were associated with

        an additional 6.38% lower opioid prescription rate and 9.78%

        lower Medicaid spending on opioids

         o This equals to $1,815 of savings per 1000 enrollees

      - Collectively, these laws were also associated with 8.69% lower

        rate of non-opioid pain medication prescriptions (Wen &

        Hockenberry, 2018)

7. Safety Profile of Medical Marijuana

   o Tolerance and Risk for Dependence

      ▪ Tolerance is more likely to occur in heavy and therapeutic users rather

        than social users

- Thought to be related to the downregulation and desensitization of CB1 receptors (Mouhamed et al., 2018)
  - The rate of transition to dependence for cannabis is less than that of other substances
    - Cannabis: 8.9%
    - Nicotine: 67.5%
    - Alcohol: 22.7% (Abrams & Guzman, 2015)
  - According to the DSM IV, 9% of cannabis users may potentially develop dependence
  - The Institute of Medicine reports that there is no evidence that marijuana is causally linked to the successive use of other illicit drugs and that it is rarely the first "gateway" drug
    - Nicotine and alcohol are usually the first "gateway" drugs (Abrams & Guzman, 2015)
- Withdrawal
  - Withdrawal from cannabis induces milder symptoms compared with withdrawal symptoms from opiates or benzodiazepines
  - There is a late onset of withdrawal symptoms from THC because of its long half-life
    - Common withdrawal symptoms include: irritability, restlessness, anxiety, depressed mood, hot flashes, anger, decreased appetite, weight loss, insomnia, and strange dreams (Abrams & Guzman, 2015)

- o Safety and Adverse Effects
  - Animal studies have found that the lethal dose of cannabis is 1,500 pounds smoked in 15 minutes and the median lethal dose is about several grams per kilogram of body weight (Abrams & Guzman, 2015)
  - The most common AEs reported are confusion, asthenia, dizziness, euphoria, disorientation, balance problems, hallucinations, somnolence, dry mouth, fatigue, nausea, vomiting, diarrhea, tachycardia, hypotension, conjunctival injection, bronchodilation, and muscle relaxation (Aviram & Samuelly-Leichtag, 2017)
  - There is moderate strength evidence to prove that cannabis intoxication is related to an increase in collision risk.
  - There is moderate strength evidence that cannabis use over 20 years does not adversely affect lung function in young adults and low strength evidence that it does not increase risk for lung, head and neck cancer.
  - There is low strength evidence that cannabis is associated with psychosis which is primarily related to THC (Nugent et al., 2017)
- o Marijuana and Mental Health
  - There is a dose-response relationship between marijuana use and the risk of psychotic disorder, predominantly in those who are predisposed to mental illness
  - Early evidence finds that while CBD may be helpful in schizophrenia, THC worsens the psychosis

- Cannabis use in association with schizophrenia can worsen the symptoms and cause multiple relapses (Mouhamed et al., 2018)
- There is no research available that concludes that cannabis causes schizophrenia (Gowen, Cahill, Russell, & Cronquist, 2018)
  - Marijuana use is not linked to diminished cognitive performance in patients with mental illness
  - Based on the Global Assessment of Functioning scale, there was no significant difference between marijuana users and non-users in their capability to adapt to problems-in-living
  - Early adolescent and heavy use of marijuana is associated with earlier episodes of psychosis (Mouhamed et al., 2018)
- Marijuana and Pregnancy
  - The use of medical marijuana is not recommended during pregnancy
    - With cannabis receptors found in the placenta, it is found that THC can cross the placenta and can also accumulate in breast milk (Mouhamed et al., 2018)
  - Maternal Health
    - Marijuana does not affect maternal health, does not complicate labor, and does not cause post-natal problems
    - There is a risk of maternal anemia with marijuana use (Mouhamed et al., 2018)
  - Neonatal Outcomes
    - Suspected to reduce birthweight by 109.42g, reduce length

- THC exposure from breast milk is thought to delay motor development at one year of age

- Suspected long term effects include poor attention, executive function, and visual analysis

- There appears to be no effect on IQ changes

- Newborns exposed to marijuana show a statistically significant increase in NICU admissions (Mouhamed et al., 2018)

8. Recommendations for Recommending Medical Marijuana

   o When recommending medical marijuana, providers should be certain that its use is not masking treatable or acute progressive conditions

   o Providers should discuss evidence-based risks versus benefits of using medical marijuana

   o "Start low and go slow" when recommending marijuana

     ▪ Providers and patients should develop an individualized plan that allows the patient the achieve maximum benefits with tolerable side effects

     ▪ If providers are recommending medical marijuana as an adjuvant to opioid therapy, they should consider decreasing the dose of opioids prescribed

   o Follow up with patients every three months to monitor efficacy of treatment and risks of misuse and abuse

   o Precautions

     ▪ Medical marijuana is not appropriate for patients with:

       - History of, or are predisposed to mental illness

       - Past or current history of substance abuse disorder

- Under the age of 25

- A history of cardiovascular, respiratory, and/ or kidney disease, or

  those who are currently breastfeeding or pregnant

  ▪ Providers should discuss taking precautions such as not driving or

  operating heavy machinery when taking medical marijuana (Mouhamed et

  al., 2018)

Outcome Measures

While there were many studies that recognized the need to further educate primary

providers on the uses of medical marijuana to enhance attitudes on its use, there were no valid

tools available that measure attitudes toward medical marijuana use for chronic pain. Therefore,

the most common scales for assessing attitudes were further researched. It is found that

dichotomous, Likert-type, and semantic differential scales are the best scales to assess attitudes.

Dichotomous questions offer two responses to a question, semantic differential questions offer

bipolar responses and responses are based on the range of value that best matches, and Likert-

type questions offer statements in which the responses are chosen based on the level of

agreement (Lovelace & Brickman, 2013). For the purposes of this study, Likert-type questions

were created to assess the uses of medical marijuana for chronic pain treatment rather than

opioids. These questions were based on the questions used in the studies conducted by Carlini,

Garrett, and Carter (2017) and Kondrad and Reid (2013) but modified to fit the purposes of this

study. Since the questions were identical in the pre-test and post-test, outcomes were measured

based on the changes in score from the pre-test and post-test.

Project Timeline

The project's timeline is displayed in a Gantt Chart in Appendix G.

Resources Needed/Economic Considerations

Resources required to complete this project included various tools to create the continuing education module such as Canvas, access to the platform, Microsoft PowerPoint, and Prezi. Economic considerations included the costs of marketing the continuing education module on various social media platforms. Further costs for this project include the co-investigators' and the principal investigator's (PI) time spent on the project and the possibility of hiring a statistician as the project progresses.

<div align="center">

Evaluation Plan

</div>

Data Analysis Plan

A paired t-test was used to determine statistically significant differences between the scores from the pre-test and post-test on Microsoft Excel.

Data Maintenance/Security

The data obtained in this study was securely stored in a password-protected computer in the Rutgers Biomedical Health Sciences building located at 65 Bergen Street, Newark NJ 07103. All data is currently locked following the RU encryption process. The electronic Canvas platform was used to collect information regarding the study which included demographic information, pre-test scores, post test scores, and evaluation surveys. Data collected was sent to the Center for Professional Development and returned to the co-investigator in a spreadsheet format. The data collected was tracked using Microsoft Excel for analysis. The data will be held at the Center for Professional Development for 6 years and destroyed after that time. This server ensures that all responses remain anonymous, as it does not collect information such as name, e-mail, or IP address. No names or identifying information is included in any publications or presentations and all responses to the questionnaire remain confidential. Subject confidentiality

is maintained and only the PI and co-investigators have access to the information from the demographics, pre-tests, and post-tests.

Anticipated Findings

The anticipated finding for this project is an enhancement of primary care providers' attitudes on the uses of medical marijuana for chronic pain treatment. The hope was that the knowledge provided in this module increased primary care providers' knowledge on the uses of medical marijuana so that they feel more comfortable having evidence-based discussions with patients who are likely candidates. This comfort and confidence in turn will ultimately lead to the decision to recommend medical marijuana rather than opioids for the treatment of chronic pain. The increases in scores between the pre-test and post-test show a statistical difference in attitudes.

Sustainability and Translation

This study has the capability of being implemented across many medical professions such as physicians, pharmacists, and physician's assistants in the future. It also has the ability to be translated nationwide because of the lack of confidence in the uses of medical marijuana seen in primary care providers nationwide. For the purposes of this study, the continuing education module was only available to nurse practitioners, nurses, and APN students in New Jersey, but can easily be applied in any state. The broad concepts covered in the module can also be applied worldwide and therefore can extend beyond New Jersey.

Dissemination

The results of this study are disseminated via paper, poster, and presentation. With the success of this study, it is also possible to publish and disseminate the findings further within a journal article.

Results

The study concluded with a total of 29 participants out of 328 individuals that were invited to participate in this study. The sample size of the study represents 48% of the 60 participants initially pursued. Out of the 29 participants, 21 identified their specialty as primary care/internal medicine. The results of the study produced key data points that were evaluated for both the total population (29) and the population of primary care/internal medicine professionals (21). A Shapiro-Wilk test was conducted on both sets of results to determine the normality of the data. Based on the results from the Shapiro-Wilk test (normal distribution for both sets – refer to appendices H and I), a paired t-test was conducted to determine the statistical significance between the pretest and posttest results. The paired t-test conducted on the 21 participants who identified their specialty as primary care/internal medicine resulted in a two-tailed p-value of 1.4955E-05 with an alpha value of 0.05. Given that the p-value is less than the chosen alpha, the null hypothesis is rejected and the data is accepted as statistically significant (Appendix I). The results imply that providing a continuing education module to New Jersey primary care providers on the uses of medical marijuana for chronic pain enhances their attitudes on recommending medical marijuana rather than prescribing opioids to patients with chronic pain. The paired t-test conducted for all 29 participants showed a two-tailed p-value of 2.965E-06 with an alpha value of 0.05. Given that the p-value is less than the chosen alpha, the null hypothesis is rejected and the data is accepted as statistically significant (Appendix H). The results imply that the continuing education module not only increases confidence in primary care/internal medicine specialties, but is effective among a broad range of specialties. Upon determining the significance of the data sets, a test was conducted to calculate the confidence interval levels (utilizing a 95% CI). The CI test was performed to determine the range of values the mean score

would fall within; based on the results, the upper and lower CIs indicate a positive increase in scores from pretest and posttest (Appendices H and I).

Discussion

The results of this study show that presenting New Jersey primary care providers with a continuing education module on the uses of medical marijuana for chronic pain enhances their attitudes of recommending medical marijuana rather than prescribing opioids to patients with chronic pain. The study measured a change in attitude with a pretest/posttest methodology. Participants were initially asked to answer two demographic related questions and a 10-question pretest. Subsequently, participants were asked to review the continuing education module. Upon completion of the module, a posttest was administered containing identical questions as the pretest. The pretest and posttest questions were answered based on a Likert scale in which the choices were rated strongly disagree, disagree, no opinion, agree, and strongly agree. A customized point system was assigned to the Likert scale to evaluate the results in which higher scores implied more regard towards the uses of medical marijuana for chronic pain treatment. In eight of the questions, strongly disagree received a score of 1, disagree equaled 2, no opinion equaled 3, agree equaled 4, and strongly agree equaled 5. Two questions were reverse-coded to convey the appropriate attitude exhibited by the participants. Results for the pretest and posttest were totaled in which each participant could receive a minimum score of 10 and a maximum score of 50 on each test. Out of the 29 total participants, 25 displayed an increase in scores between the pretest and posttest, one showed no change in scores, and three showed a decrease in scores. Out of the 29 participants, 21 were nurse practitioner students, four were nurse practitioners, two identified as other, one was a nurse, and one declined to answer. Further breakdown of the 29 participants showed that 21 identified their specialty as Primary Care /

Internal Medicine, 7 identified as Other, and one declined to provide an answer. Of the 21

participants who identified with a primary care/internal medicine specialty, 19 showed an

improvement in scores, one showed no change in score, and one showed a decrease in scores. Of

these 21 participants, 17 were nurse practitioner students and four were nurse practitioners.

Based on the results observed, it is evident that this study agrees with a similar study

done by Williams, Kessler, and Williams, 2015, which found that continuing medical education

significantly affected knowledge acquisition and retention and noted a strong relationship

between knowledge acquisition, motivation to change, and self-efficacy measures (Williams,

Kessler, & Williams, 2015). This study also coincides with studies conducted by Philpot, Ebbert,

and Hurt, 2019; Sideris, Khan, Boltunova, Cuff, Gharibo, and Doan, 2018; Kondrad & Reid,

2013; Carlini, Garrett, & Carter, 2017; and Rapp, Michalec, & Whittle, 2015. These studies all

found that there was a lack of confidence in the use of medical marijuana among practitioners

who did not have adequeate knowlede on it. Many of those studies recommended that formal

training be given to providers to increase their confidence on the uses of medical marijuana.

Based on the results, this study demonstrates that using a continuing education module can

provide the training required to improve confidence on the uses of medical maijuana to treat

chronic pain.

The overarching aim of this study was demonstrated with the use of Microsoft Excel to

perform various statistical tests including the Shapiro-Wilk test for normality, the paired t-test for

statistical significance, and a test to determine the Confidence Interval range. The results showed

that the data sets were statistically significant and with a 95% confidence level, the mean

outcome of the continuing education module led to an increase in attitude for both the upper and

lower limit. Based on the results of the statistical analysis performed, it can be reasonably

inferred that the continuing education module increases attitudes on the uses of medical

marijuana to treat chronic pain. The objectives in this study were also met with the use of the

Canvas platform to create a continuing education module, pretest, and posttest. In addition, the

Canvas platform was utilized to distribute the module to primary care providers and produce

results which could be assessed. The platform simplified the process to create the module and

incorporate the demographics questions, pretest and posttest questions, and consent notice in one

location for users to access at their own pace.

        The use of the Canvas platform served as a facilitator for this project as it provided the

most convenience for ▮▮▮▮▮ faculty and students to enroll in the continuing education module.

Although the platform was a useful facilitator, it created a barrier as it allowed only ▮▮▮▮▮

faculty and students to participate in the study, thereby limiting the population and sample size.

Another barrier that the project experienced was that it was implemented from July 1-August 31,

which potentially limited the sample size due to the reduction in classes offered during the

summer semester. As a result, the entire population of ▮▮▮▮ students and faculty may not have

had the opportunity to participate in this study. Although the barriers impacted the sample size

for evaluation, the tests performed indicated statistical significance, thereby providing insight

into a topic less explored.

        A holistic evaluation was performed to reflect on the initial objectives of the project and

final results and identify any unintended consequences from the process. Although the project

initially set out to determine the impact of the module for primary care / internal medicine

specialists, the distribution plan unintentionally allowed other specialists to participate. By

including participants beyond the initial scope, two data sets were produced for evaluation (a

total population and subset of primary care / internal medicine). This process provided vital

insight into the potential positive impacts of the module not only for primary care / internal medicine specialists, but also a broader range of medical professionals.

As previously mentioned, the Canvas tool presented barriers that limited the sample size of the project. Prior to the use of the Canvas tool, these barriers were acknowledged. However, utilization of the Canvas tool revealed additional consequences during the evaluation phase. Data sets obtained from the Canvas tool required manual intervention to transfer into a workable Excel format for statistical testing. This unforeseen effort resulted in additional work to be performed which resulted in an adjustment to the project schedule. However, the manual intervention did not impact the overall delivery plan and did not impact the integrity of the data.

Implications

Implications for Clinical Practice

The study determined it can be reasonably concluded that implementing a continuing education module will enhance primary care providers' attitudes on the uses of medical marijuana rather than opioids to treat chronic pain, thereby presenting numerous implications for clinical practice. With increased confidence, primary care providers will have the ability to talk with their patients about the uses of medical marijuana as well as answer any questions that their patients may have. The module will provide a foundation on the pharmacology of marijuana, evidence-based knowledge on the uses of medical marijuana for chronic pain, contraindications, opioids interactions, and recommendations on its use. By understanding the foundational elements, providers will be better equipped to make informed decisions on whether or not medical marijuana is an appropriate treatment for potential patients. Lastly, this module can be made available to all types of medical professionals to enhance their understanding on the uses of medical marijuana for chronic pain to advance clinical practice.

Implications for Healthcare Policy

One of the healthcare policy goals for the implementation of this module is to push for nurse practitioners to be given the authority to recommend medical marijuana. While this module was being implemented, on July 2, 2019, the A20, Jake Honig Compassionate Use Medical Cannabis Act was passed which allows advanced practice nurses to recommend medical marijuana for patients that qualify for it (Jake Honig Compassionate Use Medical Cannabis Act, 2019). The study also aims to contribute further to healthcare policy by displaying the need for an alternative treatment option for chronic pain patients and how medical marijuana can help fill that void.

Implications for Quality/Safety

Based on the implication of the study's results, the confidence gained from this module can lead to improvement in both quality and safety of chronic pain treatment. This module can lead to a better quality of care in patients who suffer from chronic pain who are receiving inadequate relief from their current pain regiments. Practitioners would now have more options with the understanding of this alternative treatment and can construct the most appropriate evidence-based approaches to treat chronic pain. This study can also increase overall safety in chronic pain treatment as practitioners can help to reduce the risk of morbidity, mortality, addictions, and overdoses related to opioid use.

Implications for Education

The findings of this study indicate that education on medical marijuana leads to enhanced attitudes on its use. With the original findings stating that there is lack of education for medical professionals on the uses of medical marijuana, it is important that modules such as the one presented in this study be provided to medical professionals not only in their place of work but

also in the academic settings. Academic settings such as medical programs, graduate programs, and nursing programs should include formal education on the uses of medical marijuana so that providers have the confidence to make informed decisions on the care of their patients. In large, this study adds to the lack of available information currently on medical marijuana and with the addition of this study, it is hoped that it can provide a basis of evidence for larger studies in New Jersey and across the United States to better improve understanding on the uses of medical marijuana.

Implications for Economics

As the opioid crisis continues to cause a significant economic burden, it is clear a more cost-effective alternative is needed to address this problem. This study aims to further advance the understanding on the uses of medical marijuana and introduce data sets which show the positive implications of the continuing education module. The positive results are exhibited with the goal of continued utilization of the module and igniting further considerations for additional studies on medical marijuana. Ultimately, by expanding the knowledge on the uses of medical marijuana, a practical alternative to opioids can be more broadly introduced within the healthcare industry with the potential to decrease the economic burden caused by the opioid epidemic.

<div align="center">

Sustainability

</div>

The education module created for this study can continued to be offered at ▮▮▮▮▮▮▮ ▮▮▮▮▮▮ through the Center for Professional Development to faculty, nursing students, and nurse practitioner students. It can also be further tailored to include medical students, physician's assistant students, and pharmacy students. This module may also be implemented by different organizations such as the National League of Nursing and different hospitals to further educate their members on medical marijuana. The goal of implementing this module is to educate

providers throughout New Jersey on the uses of medical marijuana to treat chronic pain;

therefore, making the module available for as long as possible can accomplish this goal.

Future Scholarship

The plan is for this study to be disseminated via paper, poster, and presentation at Rutgers

University. If accepted, the study can be published further in a clinical journal such as The

Clinical Journal of Pain. The positive results obtained from this study may lead to future projects

to evaluate the effect of the module in a broader concept to include a greater population across

the state and allow for other healthcare professionals such as physicians, physicians assistants,

and pharmacists to participate in it.

Summary

This study's overall aim was to enhance attitudes of New Jersey primary care providers

on the uses of medical marijuana rather than opioids for chronic pain by providing them with a

continuing education module. The results of the study imply that attitude and confidence in the

uses of medical marijuana to treat chronic pain can be increased by providing the continuing

education module to primary care providers (via a pretest/posttest methodology). This change in

attitude can lead to an increase in medical marijuana use and a decrease in opioid use to treat

chronic pain. In turn this can lead to a decrease in the economic and clinical burden caused by

opioid overuse in New Jersey.

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Appendix A

Table of Evidence

Article #	Author & Date	Evidence Type	Sample, Sample Size, Setting	Study findings that help answer the EBP Question	Limitations	Evidence Level & Quality
#1	(Abrams & Guzman, 2015)	Non-research	N/A	This article discusses the history, chemistry, biological effects, pharmacology, safety, and side effects of medical marijuana. It also discusses cannabinoids for cancer symptom management as well as guidelines for providers. Analgesic effects: CB1 receptors are found in the CNS and the peripheral nervous system and CB2 receptors are found in peripheral tissue. There are many CB1 receptors in the brain that modulate nociceptive processing. Anamide (endogenous cannabinoid) has a high affinity to CB1 receptors and 2-AG (endogenous cannabinoid) has a high affinity to CB1 and CB2 receptors. This	N/A	Level V, Quality B

				relationship between the receptors and brain is how cannabis is able to provide pain relief. CB2 also modulates pain through an anti-inflammatory role, cannabinoids act on mast cell receptors that release inflammatory agents such as serotonin, histamines, and keratinocytes to provide pain relief. It was found that 10mg of THC produced the same analgesic effects of 60mg of codeine over 7 hours whereas 20mg of THC produced effects similar to 120mg of codeine. In another study, twice as many cancer patients achieved a greater than 30% reduction in pain with a THC: CBD combination compared to the placebo group. For neuropathic pain, one study demonstrated a 34% reduced daily pain in HIV-related neuropathy and a greater than		

| | | | | 30% reduction in pain in 52% of the cannabis group compared to 17% of daily reduced pain and 24% in reduction in pain in the placebo group. There is evidence of potential synergistic effects of cannabis and opioids which can lead to a reduction in opioid use to achieve the same amount of pain relief. Cannabis receptors are not located in the brainstem which controls respiration; therefore, respiratory suppression due to overdose does not occur. Cannabis has a much safer side effect profile compared to opioids. | | |
| #2 | (Aviram & Samuelly-Leichtag, 2017) | Research (Systematic Review) | 43 Randomized Controlled Trials (RCTs) with a total of 2,437 participants. 24 RCTs (1,334) | There is moderate to high quality evidence that proves the effectiveness of cannabis-based medicines for the treatment of chronic pain. However, cannabis-based medicines are not | The first limitation of this study is that not all of the RCTs from the systematic review met the inclusion criteria for the meta-analysis. This limitation has the possibility to significantly | Level II, Quality B |

			were eligible for meta-analysis	effective for post-operative pain.	alter the results since only 24 out of 43 studies were included. In addition, this article is constrained as a result of significant heterogeneity between the studies. Each study detailed within used different cannabis derivatives, dosages, routes of administration, durations, and uncertainty levels of patients' prior uses.	
#3	(Bachhuber et al., 2014)	Research (Longitudinal Study with a time-series analysis)	All 50 States in the United States, 3 states with medical marijuana laws prior to 1999, 10 states that implemented medical marijuana laws between 1999-2000,	In the states that had medical marijuana laws at the time of the study, there was an average of 24.8% lower annual rate of opioid overdose deaths compared to states without such laws. This finding generally strengthened with the ongoing years of implementation of the medical marijuana laws. It was found that 60% of all opioid related overdoses occurred in patients who had	The analysis done in this study does not adjust for state socioeconomic status, characteristics of the population, race/ethnicity, or medical and psychiatric diagnoses. Misclassification on death certificates within the states can skew the results towards a certain conclusion. The model does not account for	Level III, Quality B

			and 37 states did not have any medical marijuana laws in this time period.	legitimate opioid prescriptions from a single provider. After excluding deaths by suicide and including heroin overdose deaths, the relationship between opioid overdose and medical marijuana laws was similar in that the states with medical marijuana laws still had a significant decrease in opioid overdoses. The study did not find any significant relationship between deaths due to septicemia and heart disease and medical marijuana laws.	different state-varying confounders within this time period and does not assess the characteristics of medical marijuana laws passed in states after 2010.	
#4	(Harout ounian et al., 2016)	Research (Prospect ive, Open-label, single-arm longitudi nal study)	176 out of 308 perspect ive participa nts complet ed this study at the ambulat ory pain clinic of the ▮▮ ▮▮▮ ▮▮▮ ▮▮▮▮ ▮ ▮▮▮	65.9% of the patients experienced a decrease in pain, 8.0% had no change from baseline, and 26.1% showed a worsening in pain from baseline. There was a 44% reduction in the use of opioids, 32 of the 73 patients using opioids discontinued them at follow up. The median morphine equivalent dose for	This study was limited by the lack of control group, lack of periodic assessment of adverse effects, and the gender inequality in the participant pool favoring males over females. Because the participants in this study were carefully selected and screened for psychiatric	Level II, Quality B

				those who were still using opioids at follow up decreased from 60mg to 45 mg. It was also shown that there was a significant improvement of physical function coinciding with the improvements of pain. Overall, cannabis was associated with a significant improvement in pain and pain related quality of life.	illnesses, low drug abuse, and no adherence risks, this study may not apply to the general population.	
#5	(Lee et al., 2018)	Non-Research (Literature Review)	7 Randomized, double-blinded, controlled trials with a total of 234 patients with neuropathic pain	It is found through a number of randomized control trials that medical marijuana is similar for pain reduction to current therapies for neuropathic pain. It also proves that vaporization and oral mucosal delivery is tolerable and safe.	Limitations of these studies include short durations and small sample sizes. Short duration periods increase the difficulty to assess long term effects whereas small sample sizes induce uncertainty in the findings.	Level V, Quality B
#6	(Mendoza & McPherson, 2018)	Research (Quasi-experimental)	94 hospice providers out of 290 from a large national hospice and palliativ	The educational intervention did not change participant's attitude, although it was positive before and after the conclusion of the course. The educational intervention	This study was created for all hospice workers including physicians, nurses, pharmacists, and social workers. With its overuse of medical terminology, it	Level II, Quality B

			e care program across 16 states	showed a significant increase in knowledge and self-perceived skills by participants which were reported overall positive. There was an increase from 41% of participants answering questions correctly before the intervention to 78% of the respondents answering questions correctly after the intervention. This study showed that an online module is effective at educating providers on medical marijuana.	may be more aimed toward the nurses and physicians so it may not have been as relatable to social workers. Due to the number of states included in the study, interpretations about state laws could not be produced. Lastly, technical difficulties with the website prevented participants from receiving the full experience.	
#7	(Mouha med et al., 2018)	Non-research (Consens us and position Statemen t)	High-quality, systematic reviews, multi-center RCTS, practice guidelin es, and meta-analyses from PubMed , Cochran e	Policies and Guidelines from Canadian medical regulatory authorities (for medical professionals): • Start low and go slow when prescribing • Medical marijuana is not appropriate for patients with a history of, or are predisposed to mental illness, past or current	N/A	Level IV, Quality A

| | | | Library and EMBASE Ovid from February 2013-August 2017. | history of substance abuse disorder, under the age of 25, a history of cardiovascular, respiratory, and/ or kidney disease, or those who are currently breastfeeding or pregnant.
• Discuss the risks versus benefits of using medical marijuana
• Discuss taking precautions such as not driving or operating heavy machinery when taking medical marijuana
• Follow up with patients every three months to monitor risks of misuse and abuse.
• Some physicians have medical marijuana patients sign a written treatment agreement.
This literature review explains the mechanism of action of medical marijuana and application of medical marijuana to certain diseases. Role in certain diseases: | | |

				• Cannabinoid receptors demonstrate antinociceptive effects on inflammatory and neuropathic pain. • Although the overall effect of marijuana on multiple sclerosis is not proven, there are indications that it is effective in reducing pain and spasticity. • For Parkinson's disease it is found that marijuana significantly improves pain scores just 30 minutes after smoking it. • Cannabis demonstrates statistically significant improvement on one or more measure of neuropathic pain. • While cannabis has been proven to improve headaches, further research is needed to better understand the effects of cannabis.		

#8	(Nugent et al., 2017)	Research (Systematic Review)	13 Systematic Reviews 27 RCTs 35 Observational Studies	There is low strength evidence that cannabis may alleviate neuropathic pain but insufficient evidence to prove that cannabis helps with other types of pain. There is moderate strength evidence to prove that cannabis intoxication is related to an increase in collision risk. There is moderate strength evidence that cannabis use over 20 years does not adversely affect lung function in young adults and low strength evidence that it does not increase risk for lung, head and neck cancer. There is low strength evidence that cannabis is associated with psychosis which is primarily related to THC.	This study is difficult to apply to clinical practice because many trials examine precise formulas of THC and cannabidiol content which is difficult to control in clinical practice. Also, the patient population was highly selective in that patients who did not respond to treatment were excluded from further study. The harms of medical marijuana that were measured are also limited because only a few patients studied were older, chronically ill, or had a history of heavy cannabis use.	Level III, Quality B
#9	(Philpot et al., 2019)	Research (Non-experimental)	62 participants out of 199 primary care providers at ▮▮▮	About 50% of the providers did not want to or were not prepared to answer patients' questions about medical marijuana. A majority of these physicians	This study is limited by the small sample size and the exclusive reference to the Minnesota State Cannabis program, which	Level III, Quality B

				believed that medical marijuana was effective for managing certain conditions. More than 1/3 of these physicians believed that medical marijuana adversely interacted with other medical therapies and few believed it improved quality of life. A majority of these physicians wanted to learn more about medical marijuana. It is important to close the knowledge gap for primary care providers by providing information on the effectiveness of medical marijuana for state qualifying conditions.	although sharing similarities to other state programs, presents material differences to be considered.	
#10	(Wen & Hockenberry, 2018)	Research (Quasi-experimental-Cross-Sectional Study)	All Medicaid fee-for-service and managed care enrollees in the United States	Medical marijuana laws were associated with a 5.88% lower rate of Medicaid-covered prescriptions for all opioids. States with adult use medical marijuana laws were associated with an additional 6.38% lower opioid prescription rate.	This data did not allow for individual patient evaluations to see if patients were decreasing their opioid use. Individual inferences can only be made based on the statistics of the state. The data does not allow	Level II, Quality B

				Adult use medical marijuana laws were also related to 9.78% lower Medicaid spending on opioids. This equals to $1815 of savings per 1000 enrollees. Collectively, these laws were also associated with 8.69% lower rate of non-opioid pain medication prescriptions.	for inferences to be made on prescription counts and dosage changes. Lastly, the cultural and geographical similarities between states that have medical marijuana laws indicates that the states were not randomly assigned.	
#11	(Whiting et al., 2015)	Research (Systematic Review)	79 Randomized control trials Total of 6462 participants	There is moderate-quality evidence in the benefits of using medical marijuana for chronic pain. Patients who used cannabinoids reported a 30% reduction in pain compared to patients who used the placebo. This study also found that there was moderate- quality evidence to prove that cannabis was beneficial in neuropathic and cancer related pain.	The RCTs included in this study included multiple different forms of cannabinoids with multiple dosages, routes of administration, and indications, all of which made data-analysis complicated. These studies also used different measures for evaluation and had a wide range of time points which constrain the applicability of the findings.	Level I, Quality A
#12	(Williams et al., 2015)	Research (Quasi-Experime	51 participants out of a	Continuing medical education significantly affects knowledge.	The first limitation is that the study group is relatively	Level II, Quality B

		ntal Study)	group of 123 at	There is a relationship between knowledge acquisition, motivation to change, and self-efficacy measures. There is also a significant association between knowledge and motivation to change practice.	small. A didactic CME activity is found to be less effective than other CME modules to change practice. This study uses a new method to assess motivation so it may or may not be reproducible by others. Lastly, this study assesses the intent to change practice which is not the same as directly measuring practice change.	

Appendix B

The Knowledge-to-Action Cycle
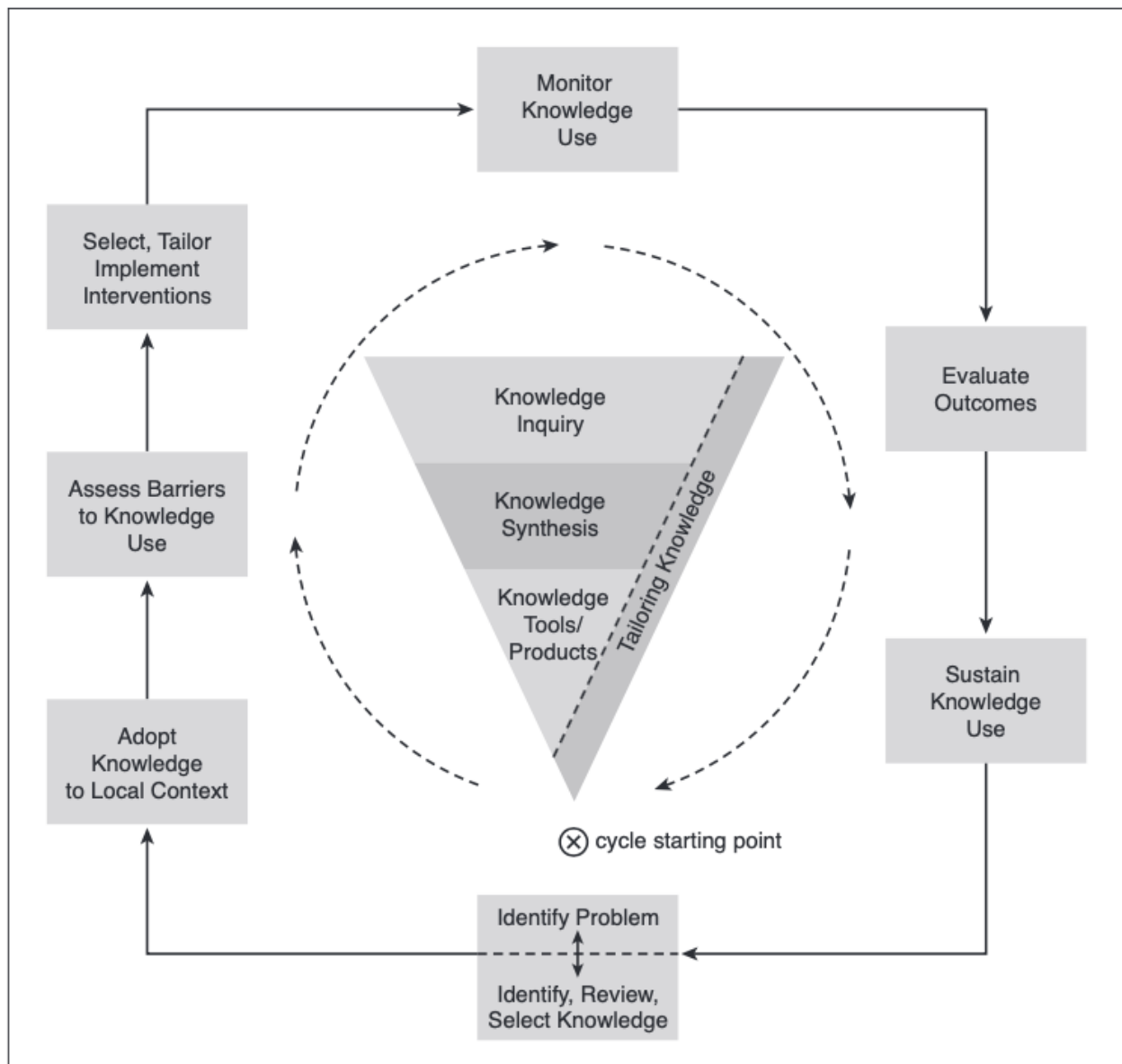
(White et al., 2016)

Appendix C

Pre-Test/Post-Test Questions

1. Medical marijuana is a legitimate treatment option for chronic pain

Strongly Disagree   Disagree   No Opinion   Agree   Strongly Agree

2. Marijuana can be addictive

Strongly Disagree   Disagree   No Opinion   Agree   Strongly Agree

3. Using marijuana poses serious mental health risks

Strongly Disagree   Disagree   No Opinion   Agree   Strongly Agree

4. The FDA should reclassify marijuana so that it is no longer a schedule I drug

Strongly Disagree   Disagree   No Opinion   Agree   Strongly Agree

5. I feel confident in my ability to identify patients who would benefit from medical

    marijuana

Strongly Disagree   Disagree   No Opinion   Agree   Strongly Agree

6. I feel comfortable discussing the risks and benefits of medical marijuana with my patients

Strongly Disagree   Disagree   No Opinion   Agree   Strongly Agree

7. Medical marijuana is a safer option for chronic pain than opioids

Strongly Disagree   Disagree   No Opinion   Agree   Strongly Agree

8. As a primary care provider, I would feel comfortable recommending medical marijuana

    for patients who qualify for it

Strongly Disagree   Disagree   No Opinion   Agree   Strongly Agree

9. It is reasonable to use medical marijuana as an adjuvant therapy to opioids to decrease

    opioid use and provide maximum pain relief

Strongly Disagree   Disagree   No Opinion   Agree   Strongly Agree

10. Nurse Practitioners, in New Jersey, should have the ability to obtain licensure to

recommend medical marijuana

Strongly Disagree   Disagree   No Opinion   Agree   Strongly Agree

Appendix D

Demographic Questions

1. I am a:

   a. Nurse Practitioner

   b. Nurse Practitioner Student

   c. Nurse

   d. Other

2. My specialty is:

   a. Primary Care/Internal Medicine

   b. Critical Care

   c. Other

Appendix E

Recruitment Flyer/Email

Rutgers School of Nursing

Let's get Comfortable with Medical Marijuana

Benefits of a Continuing Education Module to Enhance New Jersey Primary Care Providers' Attitudes about Recommending Medical Marijuana rather than Prescribing Opioids to Patients with Chronic Pain

July 1, 2019- August 31, 2019

You have been invited to participate in a research study that will assess attitudes on the uses of medical marijuana for chronic pain. The intervention will be an education module that will provide evidence based information on the uses of medical marijuana for chronic pain. The continuing education module will discuss the pharmacology, evidence-based knowledge on the uses of medical marijuana for chronic pain, contraindications, opioids interactions, and recommendations. A pre-test and post-test will be administered to evaluate the changes in attitudes on the uses of medical marijuana for chronic pain.

Eligibility: New Jersey primary care nurse practitioners, nurses, and current nurse practitioner students
Location: Electronically through Canvas platform ███████████
████████

Time Commitment and Benefits: Approximately one hour and 1 CEU/credit
For more information contact the Co-Investigator Shruti Patel
Contact Information: Shruti Patel BSN, RN, DNP Candidate
    Email: ████████████████████████

In support of improving patient care, Rutgers Biomedical and Health Sciences is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team

JOINTLY ACCREDITED PROVIDER™
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Rutgers, The State University of New Jersey, Newark NJ 07103

Version 1. 5/2/19

Appendix F

CONSENT TO TAKE PART IN A RESEARCH STUDY

TITLE OF STUDY: Benefits of a Continuing Education Module to Enhance New Jersey
Primary Care Providers' Attitudes about Recommending Medical Marijuana rather than
Prescribing Opioids to Patients with Chronic Pain
Principal Investigator: Dr. Jeanette Manchester, DNP, RN
Co-Investigator: Shruti Patel BSN, RN, DNP Candidate
Co-Investigator: Dr. Cara Padovano, DNP, APN

This consent form is part of an informed consent process for a research study and it will provide
information that will help you decide whether you want to take part in this study. It is your
choice to take part or not. After all of your questions have been answered and you wish to take
part in the research study, you will be asked to sign this consent form. You will be given a copy
of the signed form to keep. Your alternative to taking part in the research is not to take part in it.

Who is conducting this research study and what is it about?
You are being asked to take part in research conducted by Shruti Patel who is a Rutgers
University DNP student in the Adult Gerontology Primary Care program. The purpose of this
study is to assess if implementation of a continuing education module can enhance primary care
providers' attitudes on the uses of medical marijuana for chronic pain.

What will I be asked to do if I take part?
The study will take about 1 hour to complete it. We anticipate 60 subjects will take part in the
study.

What are the risks and/or discomforts I might experience if I take part in the study?
There is no potential, immediate, or long-term physical, psychological, social, financial, or
reproductive risks involved in participating in this study. Personal information and identifiers
will not be collected in this study. You can withdraw from the study at any time. If you decided
to quit before you finish the study, your answer will NOT be recorded.

Are there any benefits to me if I choose to take part in this study?
There no direct benefits to you for taking part in this research. You will be contributing to
knowledge about attitude enhancement with a continuing education module.

Will I be paid to take part in this study?
You will not be paid to take part in this study.

How will information about me be kept private or confidential?
All efforts will be made to keep your responses confidential, but total confidentiality cannot be
guaranteed. We will use the electronic Canvas platform to collect information regarding the
study which include demographic information, pre-test scores, post test scores, and evaluation
survey. Data collected will be sent to the Center for Professional Development and returned to
the primary investigator in a spreadsheet format. The data is held at the Center for Professional
Development for 6 years and destroyed after that time. We will not receive any information that

can identify you or other subjects. Data from this study will be analyzed. Study findings are professionally presented or published after analysis is complete. No information that can identify you will appear in any professional presentation or publication

What will happen to information I provide in the research after the study is over?
The information collected about you for this research will not be used by or distributed to investigators for other research.

What will happen if I do not want to take part or decide later not to stay in the study?
Your participation is voluntary. If you choose to take part now, you may change your mind and withdraw later. If you do not proceed on to the post test after completing the modules, your responses will not be recorded. However, once you submit, your responses cannot be withdrawn as we will not know which ones are yours.

Who can I call if I have questions?
If you have questions about taking part in this study, you can contact the Principal Investigator:
Shruti Patel BSN, RN, Rutgers University, call ▮▮▮▮▮▮▮▮ *or email at* ▮▮▮▮▮▮▮▮
You can also contact my faculty advisor *Dr. Cara Padovano, DNP, APN at*
▮▮▮▮▮▮▮▮▮▮ *Dr. Jeannette Manchester, DNP, RN at* ▮▮▮▮▮▮▮▮
If you have questions about your rights as a research subject, you can call the IRB Director at:
Newark HealthSci (973)-972-3608

Please download or print out this consent form if you would like a copy of it for your files.

If you do not wish to take part in the research, you may exit the study at this time or select 'I Do Not Agree' on the next quiz.

If you wish take part in the research, please select ' I agree' after reading the following:

By beginning this research, I acknowledge that I am 18 years of age or older and have read and understand the information. I agree to take part in the research, with the knowledge that I am free to withdraw my participation in the research without penalty. Do you agree to participate in this study?

| I Agree | I Do Not Agree |

Appendix G

Gantt Chart of Project's Timeline

Key Steps	December 2018-May 2019	June 2019	July 2019	August 2019	September-October 2019	November 2019	December 2019
Data Collection and Creation of CE Module							
Module Advertised Via Email and Flyers							
Module Made Available							
Data Collection: Pre-test and Post-test							
Creation of Final Paper and Presentation							
Final Project Presentation							

Appendix H

Results for statistical testing (normality test and statistical hypothesis testing) of 29 participants

in the study, inclusive of primary care/internal medicine specialists and others

Student ID	Occupation	Specialty	Pretest	Posttest	Difference			Variable 1	Variable 2
2553	Nurse Practitioner Student	Primary Care/Internal Medicine	37	39	2				
5083	Declined	Declined	36	45	9		T-Test: Paired Two Sample for Means		
28778	Nurse Practitioner	Primary Care/Internal Medicine	42	42	0				
30573	Nurse Practitioner Student	Primary Care/Internal Medicine	36	42	6			Variable 1	Variable 2
30589	Nurse Practitioner Student	Primary Care/Internal Medicine	23	45	22		Mean	34.3793103	40.4827586
30630	Nurse Practitioner	Primary Care/Internal Medicine	22	23	1		Variance	49.0295567	29.4729064
30631	Nurse Practitioner	Primary Care/Internal Medicine	32	41	9		Observations	29	29
30675	Nurse Practitioner Student	Primary Care/Internal Medicine	38	40	2		Pearson Correlation	0.61320859	
30676	Nurse Practitioner Student	Primary Care/Internal Medicine	39	44	5		Hypothesized Mean Difference	0	
30677	Nurse Practitioner	Primary Care/Internal Medicine	44	43	-1		df	28	
30693	Nurse Practitioner Student	Other	37	34	-3		t Stat	-5.8210728	
32685	Nurse Practitioner Student	Other	37	43	6		P(T<=t) one-tail	1.4825E-06	
33406	Nurse Practitioner Student	Primary Care/Internal Medicine	19	33	14		t Critical one-tail	1.70113093	
33423	Nurse Practitioner Student	Primary Care/Internal Medicine	28	39	11		P(T<=t) two-tail	2.965E-06	
36184	Nurse	Other	39	38	-1		t Critical two-tail	2.04840714	
37546	Nurse Practitioner Student	Primary Care/Internal Medicine	28	40	12				
37562	Nurse Practitioner Student	Primary Care/Internal Medicine	39	48	9		Confidence Interval Test		
37573	Nurse Practitioner Student	Primary Care/Internal Medicine	41	42	1		Mean Difference	6.10344828	
37673	Nurse Practitioner Student	Other	33	34	1		Standard Deviation of Mean Difference	5.64639473	
37689	Nurse Practitioner Student	Primary Care/Internal Medicine	27	37	10		Standard Error of Difference	1.04850918	
37775	Nurse Practitioner Student	Other	43	47	4		T Alpha Half 95% Confidence Interval	2.045	
45186	Nurse Practitioner Student	Primary Care/Internal Medicine	28	43	15		Lower Confidence Interval	3.95924701	
45320	Nurse Practitioner Student	Primary Care/Internal Medicine	42	49	7		Upper Confidence Interval	8.24764955	
45325	Nurse Practitioner Student	Primary Care/Internal Medicine	44	49	5				
53686	Nurse Practitioner Student	Primary Care/Internal Medicine	30	39	9				
69243	Nurse Practitioner Student	Primary Care/Internal Medicine	24	35	11				
99501	Other	Other	34	40	6		Test for Normality - Shaprio-Wilk		
102573	Other	Other	37	40	3		alpha = 0.05		
103611	Nurse Practitioner Student	Primary Care/Internal Medicine	38	40	2		p value = 0.282896		
							Since p-value > α, H0 was accepted. It is assumed that the data is normally distributed.		

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Appendix I

Results for statistical testing (normality test and statistical hypothesis testing) of 21 participants

in the study, inclusive of primary care/internal medicine specialists only

Student ID	Occupation	Specialty	Pretest	Posttest	Difference				
2553	Nurse Practitioner Student	Primary Care/Internal Medicine	37	39	2				
28778	Nurse Practitioner	Primary Care/Internal Medicine	42	42	0		T-Test: Paired Two Sample for Means		
30573	Nurse Practitioner Student	Primary Care/Internal Medicine	36	42	6				
30589	Nurse Practitioner Student	Primary Care/Internal Medicine	23	45	22			Variable 1	Variable 2
30630	Nurse Practitioner	Primary Care/Internal Medicine	22	23	1		Mean	33.3809524	40.6190476
30631	Nurse Practitioner	Primary Care/Internal Medicine	32	41	9		Variance	61.547619	33.247619
30675	Nurse Practitioner Student	Primary Care/Internal Medicine	38	40	2		Observations	21	21
30676	Nurse Practitioner Student	Primary Care/Internal Medicine	39	44	5		Pearson Correlation	0.6698705	
30677	Nurse Practitioner	Primary Care/Internal Medicine	44	43	-1		Hypothesized Mean Difference	0	
33406	Nurse Practitioner Student	Primary Care/Internal Medicine	19	33	14		df	20	
33423	Nurse Practitioner Student	Primary Care/Internal Medicine	28	39	11		t Stat	-5.6725896	
37546	Nurse Practitioner Student	Primary Care/Internal Medicine	28	40	12		P(T<=t) one-tail	7.4777E-06	
37562	Nurse Practitioner Student	Primary Care/Internal Medicine	39	48	9		t Critical one-tail	1.72471824	
37573	Nurse Practitioner Student	Primary Care/Internal Medicine	41	42	1		P(T<=t) two-tail	1.4955E-05	
37689	Nurse Practitioner Student	Primary Care/Internal Medicine	27	37	10		t Critical two-tail	2.08596345	
45186	Nurse Practitioner Student	Primary Care/Internal Medicine	28	43	15				
45320	Nurse Practitioner Student	Primary Care/Internal Medicine	42	49	7				
45325	Nurse Practitioner Student	Primary Care/Internal Medicine	44	49	5		Confidence Interval Test		
53686	Nurse Practitioner Student	Primary Care/Internal Medicine	30	39	9		Mean Difference	7.23809524	
69243	Nurse Practitioner Student	Primary Care/Internal Medicine	24	35	11		Standard Deviation of Mean Difference	5.84726228	
103611	Nurse Practitioner Student	Primary Care/Internal Medicine	38	40	2		Standard Error of Difference	1.27597724	
							T Alpha Half 95% Confidence Interval	2.08	
							Lower Confidence Interval	4.58406258	
							Upper Confidence Interval	9.89212789	
							Test for Normality - Shaprio-Wilk		
							alpha = 0.05		
							p value = 0.297543		
							Since p-value > α, H0 was accepted. It is assumed that the data is normally distributed.		

Appendix J
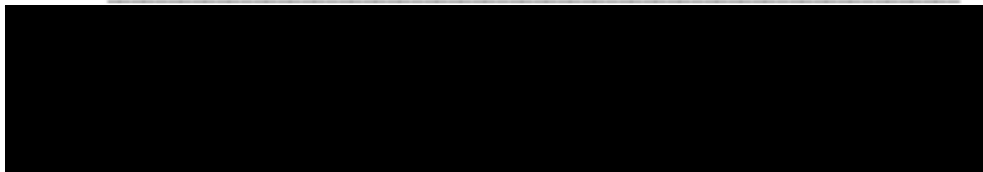
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Appendix 5: DNP Team Signature Sheet

DNP Team Signatures

Full Title of DNP Project: Benefits of a Continuing Education Module to Enhance New Jersey Primary Care Providers' Attitudes about Recommending Medical Marijuana rather than Prescribing Opioids to Patients with Chronic Pain

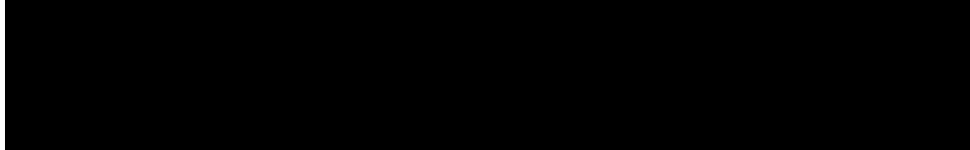**DNP Student Information:**

Name: Shruti S. Patel

I have reviewed the Rutgers DNP Requirements and understand my responsibilities: ■ Y ☐ N
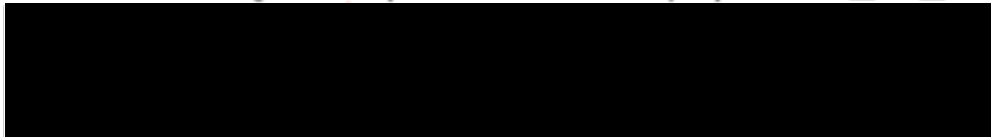
Signature: _____ Date: 1/30/2019

DNP Chair (Name & Credentials) Cara Padovano, DNP, APN

I have reviewed the Rutgers DNP Requirements and understand my responsibilities: ■ Y ☐ N

DNP Team Member (Name & Credentials): Jeannette Manchester

I have reviewed the Rutgers DNP Requirements and understand my responsibilities: ■ Y ☐ N

DNP Team Member (Name & Credentials): _____

I have reviewed the Rutgers DNP Requirements and understand my responsibilities: ☐ Y ☐ N

Signature_____ Date_____

Email_____ Telephone#_____