

7-10-2019

Examining Opioid Ordering Rates of Advanced Practice Providers in an Emergency Department

Bridgette Thompson

University of Missouri-St. Louis, bpt9c2@mail.umsl.edu

Follow this and additional works at: <https://irl.umsl.edu/dissertation>



Part of the [Medical Education Commons](#)

Recommended Citation

Thompson, Bridgette, "Examining Opioid Ordering Rates of Advanced Practice Providers in an Emergency Department" (2019). *Dissertations*. 851.

<https://irl.umsl.edu/dissertation/851>

This Dissertation is brought to you for free and open access by the UMSL Graduate Works at IRL @ UMSL. It has been accepted for inclusion in Dissertations by an authorized administrator of IRL @ UMSL. For more information, please contact marvinh@umsl.edu.

Examining Opioid Ordering Rates of Advanced Practice Providers in an Emergency

Department

Bridgette Thompson

MSN University of Missouri-St. Louis, 2017

BSN St. Louis University, 2001

A Dissertation Submitted to the Graduate School

at the University of Missouri-St. Louis

in partial fulfillment of the requirements for the degree

Doctor of Nursing Practice

August

2019

Advisory Committee

DNP Committee Chair, Nancy Magnuson, DSN, APRN, FNP-BC

DNP Committee Member, Melissa Ehmke, DNP, RN, CLC

DNP Committee Member, Abigail Nieters, FNP-C

Abstract

Problem Opioid abuse has become a major public health issue in America. Many Americans die daily from an opioid overdose. The Centers for Disease Control and Prevention (CDC) has identified prescription drug abuse and overdose as a major health threat.

Methods Descriptive cohort design with a retrospective record review of the number of opioids ordered by the advanced practice provider six weeks before and six weeks after a didactic and simulation educational experience.

Results The total sample was four (N=4). Using the paired samples *t* test there was no difference ($t = 0.65, p = 0.56$) between the number of opioids ordered by the providers before and after the didactic and simulation educational experience.

Implications for Practice Feedback regarding the educational program indicated that providers found the program helpful and applicable to practice. The providers also found the discussion time together useful and productive. However, the number of opioids ordered did not significantly change based on statistical tests. Future research in education and opioid treatment is needed. Developing residency programs for nurse practitioners and physician assistants to help facilitate transitioning into the *provider prescribing role* would be advantageous. Implementing specific guidelines for opioid prescribing based on evidence-based practice will reinforce advanced practice provider confidence and competence. Improvements in providing education on opioid safety will strengthen practice, promote the effectiveness of treatment, and decrease the risks associated with opioid overdose and abuse.

EXAMINING OPIOID ORDERING RATES OF ADVANCED PRACTICE
PROVIDERS IN AN EMERGENCY DEPARTMENT

The United States is currently facing a national epidemic that has reached a crisis in our communities. Opioid abuse has become a major public health issue in America. Over the past decade, the number of drug overdose deaths has rapidly grown, largely driven by the rise in opioid-related prescriptions (Ratycz, Papadimos, & Vanderbilt, 2018). The increase in opioid abuse is one of the driving factors of this epidemic. In 2016, there were over 63,600 drug overdose deaths and opioids contributed to 42,249 of these deaths (Ratycz et al., 2018). On average, 115 Americans die daily from an opioid overdose (Ratycz et al., 2018). The Centers for Disease Control and Prevention (CDC) has identified prescription drug abuse and overdose as a major health threat (Cobaugh et al., 2014).

Opioids are used to treat moderate to severe pain. This class of drugs include medications such as, codeine, hydrocodone, oxycodone, morphine, and fentanyl. Opioid treatment benefits include obtaining a level of analgesia that allows activities of daily living to be maintained and in some situations, this treatment will allow for a patient being able to continue their daily activities that otherwise may have been intolerable (Hudspeth, 2016). Opioid pain medications are generally safe when they are taken as prescribed and for short periods of time; however, opioids have the ability to produce feelings of euphoria and because of this, opioids are often misused (CDC, 2018).

Existing data shows that the emergency department is a significant contributor to opioid abuse (Wilsey, Fishman, & Ogden, 2005). Patients visiting the emergency department commonly are treated for pain; opioids are usually the treatment of choice

(Castellucci, 2018). With minimal time and often no previous patient relationship or history, emergency room providers can often feel pressured to make quick decisions regarding pain management where there may be a struggle between providing sufficient analgesia without producing the potential for abuse (Elder, DePalma, & Pines, 2017). Differentiating between patients who are seeking to misuse opioids and those who are truly seeking satisfactory pain relief can be difficult.

A practice change is needed in hopes of eradicating the opioid epidemic. According to Ratycz (2018), one reason for this epidemic may be the lack of provider education regarding opioids. Providing our emergency department providers with the resources that are needed to improve clinical decision making is imperative. This includes identifying patients at risk for opioid abuse, acknowledging signs and symptoms of opioid abuse, following proper opioid prescription guidelines, and recognizing when the need arises for referral of patients who are addicted (Ratycz et al., 2018).

The role of advanced practice providers continues to evolve. The advanced practice provider is needed to bridge gaps in healthcare caused by provider shortages. Although graduate programs for advanced practice providers have improved curriculum to better prepare these individuals for practice, many report feeling underprepared for the complex populations cared for in the emergency department (Ratycz et al., 2018). Challenges of transition to practice could be minimized through specialized training. Over the past 20 years, simulation-based health education has become an asset in curriculum. High fidelity simulation education can provide advanced practice providers opportunities to enhance their skills, augment their emotional intelligence, and increase

self-assurance, allowing them to successfully manage opioid abuse. Ultimately this will improve patient outcomes and save lives.

The purpose of this quality improvement initiative was to utilize high fidelity simulation as an opioid educational simulation experience to provide advanced practice providers in an urban Midwestern level one trauma center emergency department with the knowledge necessary to recognize signs and symptoms of opioid abuse and follow proper prescription guidelines to prevent opioid addiction or overdose. The goal of this project was to decrease the number of opioids ordered by the advanced practice providers in the emergency department.

The question for study was: With patients being treated for pain in the emergency department, what was the number of opioids ordered by an advanced practice provider for six weeks before an educational simulation experience in comparison to six weeks after an educational simulation experience?

Review of the Literature

A literature search was conducted using Cumulative Index of Nursing and Allied Health Literature (CINAHL) and Medline (Ovid). The searches included keywords such as: *opioid abuse, opioid epidemic, opioid addiction, opioid guidelines, emergency nursing, simulation-based education, and medical school curricula*. The results were filtered to include years, 2005 to 2019, and full-text publications published in peer reviewed journals. Many articles were opinions, not well defined, or presented vague and inconsistent results and were excluded. The reference list from key publications were mined for review. The following themes organized the literature review: recognizing opioid abuse, addressing the opioid epidemic, emphasis on opioid education, role of the

advanced practice provider, benefits of simulation-based education, and the use of opioid prescribing guidelines.

According to the surgeon general, opioid prescriptions have increased markedly over the past 20 years and, now, nearly two million people in America have a prescription opioid use disorder (Goodwin, 2016). In the past physicians were encouraged to be more assertive when treating pain. Many were taught that opioids were not habit-forming when prescribed for substantial pain. This has proven to be inaccurate and the consequences resulting from overprescribing practices have been devastating. There is an opioid epidemic that spans across the region and no social, racial, gender, age, or demographic group is immune (Goodwin, 2016). Addressing the opioid epidemic requires a coordinated effort from all health care professionals. Multiple disciplines, as well as, professional nursing organizations have recommended strategies and published policy statements regarding opioid abuse; efforts have included the development of provider education and the circulation of opioid prescribing guidelines (Naegle et al., 2017).

Advanced practice providers can be defined as nurse practitioners and physician assistants. Both nurse practitioners and physician assistants hold advanced degrees and provide direct patient care under the supervision of a physician (Nurse Journal, 2019). In recent years, professionals in both roles have gained a greater level of independence as a growing number of states have relaxed requirements related to physician collaboration and oversight; however, for the state in which this project was carried out, practice and licensure laws place certain restrictions on advanced practice provider practice (Nurse Journal, 2019) (American Association of Nurse Practitioners [AANP], 2019). State law

imposes restrictive prescribing and requires physician oversight/supervision (Nurse Journal, 2019) (American Association of Nurse Practitioners [AANP], 2019).

The number of patient visits to the emergency department continues to increase and the employment of advanced practice providers has steadily increased as well (Chekijian, Elia, Monti, & Temin, 2018). Changes in residency hour requirements and increased patient volume have changed the staffing of emergency departments and teaching hospitals; advanced practice providers undergo generalized training in medicine prior to entering practice but have no post-graduate training specific to their specialized area (Chekijian, Elia, Monti, & Temin, 2018). Supervision requirements vary by state statutes, and in many cases, once the advanced practice provider has demonstrated competency, low-acuity patients can be assessed and treated independently without direct supervision of a physician (Chekijian et al., 2018). Treating pain in the emergency department can be complex for advanced practice providers. In recent years, the ensuing misuse of opioids has led to the investigation of physician prescribing opioids (Weiner et al., 2017). Some government entities have paid close attention to emergency department providers, more likely because they serve a high volume of patients seeking treatment for pain, lack an existing patient-provider relationship, and are sometimes the primary prescriber of an opioid analgesic for patients who subsequently develop opioid use disorder (Weiner et al., 2017). There has also been an association made between the emergency department and overdose, the reasoning is evidenced by emergency providers prescribing opioids for pain and also treating overdoses (Weiner et al., 2017). A study conducted by Weiner et al., demonstrated that emergency department provider opioid

prescribing guidelines were associated with a decrease in the quantity of opioid analgesics issued by emergency department providers (2017).

The prevalence of opioid abuse in the United States and the clinical challenges facing providers treating pain indicates the importance of advanced practice providers having the knowledge to better ensure safe and effective treatment for patients warranting the use of opioid analgesics (Bruckenthal & Gilson, 2019). Advanced practice providers are commonly faced with limited formal pain management education. Recent research suggests that the potential for opioid analgesic-related abuse is intensified by prescribing practices that fail to adhere to guidelines and practice standards (Bruckenthal & Gilson, 2019). Advanced practice providers need to use available evidence and resources when prescribing opioids. Using best practice principles can assist the advanced practice provider to meet their professional responsibilities for safe opioid prescribing; this protects the practice, the patient, and the public (Hudspeth, 2016).

Simulation-based education is designed to reproduce aspects of the real world in an interactive manner that allows learners to be submerged in the learning environment (Aebersold, 2018). Simulation-based education has been shown to develop inherent memory which may facilitate heightened acquisition and long-term recall (Alluri, Tsing, Lee, & Napolitano, 2016). The core of medical training has traditionally consisted of lectures and textbooks; however, with the rise in technology, researchers have been exploring the value of simulation in medical education (Alluri et al., 2016). A randomized controlled trial of high-fidelity simulation versus lecture-based education for medical students was conducted. Twenty medical students were randomized to four groups. Each group received two simulations and two lectures that covered four different

topics. The students were given a pre-test, a post test, and a delayed post-test ($p<0.05$). While students in the lecture group did not demonstrate improvement ($p<0.05$), this study demonstrated superior long-term knowledge retention in simulation-based education as compared to lectures (Alluri et al., 2016).

There has been significant use of simulation in healthcare education internationally. Healthcare professionals are beginning to see increased demands on clinical hours and a focus on patient safety that has led to a new model of education in a field that increasingly involves technology and innovative ways to provide a standard of curriculum that will strengthen comprehension and improve learner confidence (Ratycz et al., 2018). A prospective, longitudinal design study was conducted to evaluate the use of an opioid dosing simulator to teach residents appropriate use of opioids to treat and manage acute pain. 120 resident trainees completed 1582 simulator trials ($M=13.2$, $SD=6.8$) with continuous improvements in their simulated pain management practices (Kannampallil et al., 2018). Over a period of time, the trainees improved their total simulated pain management scores ($b=0.05$, $p<0.01$), generated lower pain score ranges with less variability ($b= -0.02$, $p<0.01$), switched more rapidly from short-term to long-term agents ($b=0.50$, $p<0.01$), and used naloxone less often ($b= -0.10$, $p<0.01$) (Kannampallil et al., 2018). Simulation proves to be a potential tool for training healthcare providers on opioid management. The results from this study highlight the vigor of learning how to properly manage opioids using simulation and it also emphasizes how the transfer of simulation learning to real world settings can have a significant impact on resident training, the appropriate use of opioids, and patient safety (Kannampallil et al., 2018).

Literature suggests a valid relationship between increased opioid prescribing and increased opioid addiction (Young, Crausman, & Fulton, 2018). Limiting the number of opioid prescriptions might be effective in reducing the number of opioid-related deaths. An evidence-based quality-improvement project was designed and piloted in four urgent care clinics. Results of the intervention were monitored by comparing opioid prescribing before and after adoption of the utilization of the state-sponsored prescription drug monitoring program (PDMP) (Young, Crausman, & Fulton, 2018). A statistically significant ($p < 0.05$) decline in the rate of opioid prescribing was revealed. These results suggest that implementing a simple opioid prescription guideline, with monitoring can reduce suboptimal opioid prescribing (Young, Crausman, & Fulton, 2018). Provider awareness, education, and changes in practice are all critical factors for effectively managing acute/chronic pain and ensuring patient safety.

Healthcare providers have a responsibility for improving the way opioids are prescribed. Clinical prescribing guidelines can reassure that patients have access to safe and effective treatment. Clinical prescribing guidelines can safeguard the number of people who misuse, abuse, or overdose from opioids. Clinical prescribing guidelines may also help physicians make critical pain management decisions (Lyapustina et al., 2017). Patients who have been prescribed opioids are susceptible to opioid abuse. This patient population may first be seen in the emergency department setting; therefore, it is necessary to implement useful tools to ensure that all patients at risk for opioid use disorder are identified prior to any adverse drug events or further drug dependency (Sahota et al., 2018). The CDC has published a guide-providing recommendations for the prescribing of opioid pain medications. The CDC's "Guideline for Prescribing Opioids

for Chronic Pain” is an instrument that can be implemented to improve the safety and effectiveness in treating pain, as well as, reduce the risks associated with opioid misuse and abuse (CDC National Center for Injury Prevention and Control, 2018). Education of healthcare staff on suitable and effective treatment of pain is recommended to minimize opioid abuse; healthcare providers must be vigilant and ensure appropriate management of pain while minimizing misuse and abuse (Cobaugh et al., 2014).

Change is constant. Theories of change have proven effectiveness in the ability of institutions to modify their strategies, processes, and structures (Hussain, Lei, Hussain, & Ali, 2018). Healthcare professionals must help others see the need for change, work with others to implement change, evaluate the effect of change, and participate in each stage of the change process (Grossman & Valiga, 2017). The framework selected for this study is the Plan-Do-Study-Act (PDSA) cycle used in quality improvement and is valuable for implementing and sustaining change (Hickey & Brosnan, 2017).

Method

Design: A descriptive cohort design with a retrospective record review of the number of opioids ordered by an advanced practice provider was completed over a six-week period from February-April 2019. An educational simulation experience was then provided over a one-week period for the advanced practice providers in the emergency department.

Another retrospective record review for the number of opioids ordered was then conducted over a six-week period from April-May 2019.

Setting: A level-one trauma center emergency department in a Midwestern metropolitan area with over three million residents. The emergency department treats just over 50,000 patients per year. There were seven advanced practice providers employed in the

emergency department within a state requiring collaborative practice agreements and restricted prescribing privileges. The advanced practice providers are not restricted on the type of patients they may treat.

Sample: A convenience sample of advanced practice providers. Inclusion criteria were those employed in the emergency department. Exclusion criteria were those not employed in the emergency department.

Approval Processes: Administrative approval was obtained from the emergency department director. Approvals from the Doctor of Nursing practice committee, the graduate school, and the Institutional Review Boards from the university and the medical center were obtained.

Data Collection/Analysis: The type of provider and years of experience was recorded, in addition, the number of opioids ordered by an advanced practice provider was obtained. All personal identifiers were removed. A paired t-test was used to compare pre-educational simulation experience opioid ordering to post educational simulation experience opioid ordering. SPSS version 25 was used to analyze the data.

Procedures: An educational simulation experience, lasting approximately 75 minutes, was provided for the advanced practice providers who are staffed in the emergency department. The educational simulation experience consisted of a lecture reviewing the CDC Guidelines (CDC, 2018) for Prescribing Opioids for Chronic Pain and high fidelity simulation scenarios which focused on effective provider/patient communication and safe prescribing guidelines. A debriefing followed the simulation. A video was presented showing effective provider/patient communication when prescribing opioids. A brief voluntary anonymous survey was given to the advanced practice providers upon

completion of the educational simulation experience. All patient information was protected. No identifiers were revealed. Opioid medications ordered by advanced practice providers in the emergency department was tracked for six weeks before the educational simulation experience and was also tracked for six weeks after the educational simulation experience. The opioid ordering data was retrieved by the medical center emergency department pharmacist.

Results

All seven providers who are staffed in the emergency department were invited to participate in the educational simulation experience. One provider declined participation due to a schedule conflict. One provider did not respond. One provider participated in the educational simulation experience and completed the survey but was excluded from the data analysis because this provider had not been employed in the emergency department during the entire pre-educational simulation experience time period. The total number of advanced practice providers who participated in the educational simulation experience was five (N=5). The survey data revealed that 60% (n=3) of the providers were nurse practitioners and 40% (n=2) were physician assistants. 40% (n=2) of the providers had less than one year experience under their title, 40% (n=2) had 1-2 years of experience under their title, and 20% (n=1) had 3-4 years of experience under their title. A Likert scale was used with categories listed as: *Strongly agree, agree, neutral, disagree, and strongly disagree*. 80% (n=4) of the providers strongly agreed that opioid abuse is an issue in the emergency department, 20% (n=1) agreed. 60% (n=3) of the providers strongly agreed that the educational simulation experience was useful, 40% (n=2) agreed. 40% (n=2) of the providers strongly agreed that their practice would change as a result of

the educational simulation experience, 40% (n=2) of the providers agreed, and 20% (n=1) of the providers remained neutral. The total number of advanced practice providers who were involved in the data analysis sample was four (N=4). This analysis revealed that Provider 1 increased ordering rates from 49 (n=49) to 56 (n=56). Provider 2 decreased ordering rates from 45 (n=45) to 38 (n=38). Provider 3 increased ordering rates from 12 (n=12) to 15 (n=15). Provider 4 decreased ordering rates from 60 (n=60) to 43 (n=43). Two of the providers decreased the number of opioids ordered between the pre-educational simulation experience period and the post-educational simulation experience period. Two of the providers increased the number of opioids ordered between the pre-educational simulation experience period and the post-educational simulation experience period. Collectively, there was a total of 166 (N=166) opioids ordered during the pre-educational simulation experience period and there was a total of 152 (N=152) opioids ordered during the post-educational simulation experience period.

The data was analyzed using the paired samples *t* test. The data analysis revealed that there was no statistically significant difference ($t = 0.65, p = 0.56$) between the number of opioids ordered by the providers before the educational simulation experience in comparison to the number of opioids ordered by the providers after the educational simulation experience; therefore, the null hypothesis is accepted. The general consensus from the voluntary surveys revealed that the educational experience was beneficial.

Discussion

The results obtained, collectively, showed an overall decrease (8%) in the number of opioids ordered after the educational experience. This shows a clinically significant difference in the number of opioids ordered by the advanced practice providers. The data

analysis proved that there was no statistically significant difference between the data before and after the educational experience. The project had a number of limitations. Using a larger sample size and examining data over a longer period of time may have exhibited different results. The data was collected under the assumptions that the number of patients, types of patients, and acuity of patients treated in the emergency department before the educational experience would reflect the same number of patients, types of patients, and acuity of patients treated in the emergency department after the educational experience. These issues were not controlled. Consideration of these factors could help to strengthen this type of research project in the future.

Further research in education and opioid treatment is needed. Future studies could assess if appropriate opioid prescribing actually decreases the risk for opioid abuse. Ordering trends in the emergency department by provider types could be examined. Future studies could also investigate what provider barriers complicate appropriate opioid prescribing. Implementing guidelines in addition to other protocols may elicit promising results. The implications for future practice are to increase the advanced practice providers' knowledge of prescribing opioids. Developing residency or fellowship programs for nurse practitioners and physician assistants to help facilitate transitioning into the provider role would be advantageous. Implementing specific protocols and/or guidelines for opioid prescribing based on evidence based practice will reinforce advanced practice providers' confidence and competence. Offering continuing education courses in opioid management could help safeguard an essential level of understanding for prescribing opioids. These proposals will be recommended to the stakeholders. Improvements in providing education on opioid safety will strengthen practices, promote

the effectiveness of treatment, and decrease the risks associated with opioid abuse and overdose.

Conclusion

Despite the statistical analysis, this project did show clinical significance. The goal of this project was to decrease the number of opioids ordered after the educational simulation experience as compared to the number of opioids ordered before the simulation educational experience. Overall, there was an 8% decrease in the number of opioids ordered post experience. The general consensus, as evidenced by the voluntary survey, was that the educational simulation experience was valuable. The project's aim was to increase the emergency department advanced practice providers' awareness of evidence-based guidelines when prescribing opioids for pain management.

Implementation of these guidelines will have a favorable impact on the hospital system because the risk of improperly prescribing opioids for pain management would be eliminated. The new practice guidelines should lead to a decrease in the misuse of opioid pain medications. The improved patient outcomes will have a positive impact on healthcare. The number of deaths associated with opioid misuse will decline and the financial burden that is placed on the healthcare system, as a whole, will decrease.

References

- American Association of Nurse Practitioners. (2019). State practice environment. Retrieved from <https://www.aanp.org/advocacy/state/state-practice-environment>
- Aebersold, M. (2018). Simulation-based learning: No longer a novelty in undergraduate education. *Online Journal of Issues in Nursing*, 23(2).
<http://dx.doi.org/10.3912/OJIN.Vol23No02PPT39>
- Alluri, R., Tsing, P., Lee, E., & Napolitano, J. (2016). A randomized controlled trial of high-fidelity simulation versus lecture-based education in preclinical medical students. *Medical Teacher*, 38, 404-409.
- Bruckenthal, P., & Gilson, A. (2019). Development and validation of the Achieving Effective and Safe Opioid Prescribing-Advanced Practice Registered Nurse (AESOP-APRN) survey: A pilot study. *Pain Management Nursing*, 20, 214-221.
- Castellucci, M. (2018, February 12). Colorado ERs work together to lower opioid prescribing by 36%. *Modern Healthcare*, 48(7). Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=cin20&AN=128022402&site=ehost-live&scope=site>>
- CDC National Center for Injury Prevention and Control. (2018). QI implementation steps. Retrieved from <https://www.cdc.gov/drugoverdose/pdf/prescribing/CDC-DUIP-QualityImprovementAndCareCoordination-508.pdf>
- Centers for Disease Control and Prevention [CDC]. (2018). CDC guideline for prescribing opioids for chronic pain. Retrieved from <https://www.cdc.gov/drugoverdose/prescribing/guideline.html>

- Chekijian, S., Elia, T., Monti, J., & Temin, E. (2018). Integration of advanced practice providers in academic emergency departments: Best practices and considerations. *AEM Education and Training*, 2(S1), S48-S55.
- Cobaugh, D., Gainor, C., Gaston, C., Kwong, T., Magnani, B., McPherson, M., ... Krenzelok, E. (2014, September 15). The opioid abuse and misuse epidemic: Implications for pharmacists in hospitals and health systems. *American Journal of Health-System Pharmacy*, 71(18), 1539-1554.
- Elder, J., DePalma, G., & Pines, J. (2017). Optimal Implementation of Prescription Drug Monitoring Programs in the Emergency Department. *Western Journal of Emergency Medicine*, 19(2), 387-391.
- Goodwin, J. (2016, September 19). Recognizing the impact of opioid abuse. *Business West*, 33(11), 12.
- Grossman, S., & Valiga, T. (2017). *The new leadership challenge: Creating the future of nursing* (5th ed.). Philadelphia, PA: F. A. Davis Company.
- Hickey, J., & Brosnan, C. (2017). Quality improvement. In E. Giardino (Ed.), *Evaluation of health care quality for DNPs* (2nd ed.) (pp. 189-206). New York, NY: Springer.
- Hudspeth, R. (2016). Safe opioid prescribing for adults by nurse practitioners: Part I. Patient history and assessment standards and techniques. *The Journal for Nurse Practitioners*, 12(3), 213-220.
- Hudspeth, R. (2016). Safe opioid prescribing for adults by nurse practitioners: Part II. Implementing and managing treatment. *The Journal for Nurse Practitioners*, 12(4), 213-220.

- Hussain, S. T., Lei, S., Hussain, M. J., & Ali, M. (2018). Kurt Lewin's change model: A critical review of the role of leadership and employment involved in organizational change. *Journal of Innovation & Knowledge*, 3(3), 123-127.
- Kannampallil, T., McNutt, S., Faick, S., Galanter, W., Patterson, D., Darabi, H., Sharabiani, A., Schiff, G., Odwazny, R., Vaida, A., Wilkie, D., & Lambert, B. (2018). Learning optimal opioid prescribing and monitoring: A simulation study of medical residents. *Journal of the American Medical Informatics Association Open*, 1 (2), 246-254.
- Lyapustina, T., Castillo, R., Omaki, E., Shields, W., McDonald, E., Rothman, R., & Gielen, A. (2017). The contribution of the emergency department to opioid pain reliever misuse and diversion: A critical review. *Pain Practice*, 17(8), 1097-1104.
- Naegle, M., Mitchell, A., Finter, M., Dunphy, L., Vanhook, P., & Delaney, K. (2017). Opioid misuse epidemic: Addressing opioid prescribing and organization initiatives for holistic, safe, and compassionate care. *Nursing Outlook*, 65(4), 477-479.
- Nurse Journal. (2019). Nurse practitioner vs. physician assistant. Retrieved from <https://nursejournal.org/nurse-practitioner/np-vs-physician-assistants/>
- Ratycz, M., Papadimos, T., & Vanderbilt, A. (2018). Addressing the growing opioid and heroin abuse epidemic: A call for medical school curricula. *Medical Education Online*, 23(1). <http://dx.doi.org/10.1080/10872981.2018.1466574>
- Sahota, P., Shastry, S., Mukamel, D., Murphy, L., Yang, N., Lotfipour, S., & Chakravarthy, B. (2018, May 23). Screening emergency department patients for

opioid drug use: A qualitative systematic review. *Addictive Behaviors*, 85, 139-146. <http://dx.doi.org/10.1016/j.addbeh.2018.05.022>

Wilsey, R., Fishman, S., & Ogden, C. (2005). Prescription opioid abuse in the emergency department. *Journal of Law, Medicine, and Ethics*, 770-780.

Young, L., Crausman, R., & Fulton, J. (2018). Suboptimal opioid prescribing: A practice change project. *Rhode Island Medical Journal*, 41-44.

Weiner, S., Baker, O., Poon, S., Rodgers, A., Garner, C., Nelson, L., & Schuur, J. (2017). The effect of opioid prescribing guidelines on prescriptions by emergency physicians in Ohio. *Annals of Emergency Medicine*, 70(6), 799-808.

Appendix A

Figure 1: Ordering Rates of Advanced Practice Providers Before and After Educational Simulation Experience

