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The Opioid Crisis: Evaluating Current Practices and Outcomes for Neonatal Abstinence Syndrome

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ABSTRACT

Neonatal Abstinence Syndrome (NAS) in the infant are severe symptoms from opioid exposure in utero. These symptoms include: “central nervous system irritability, autonomic over-reactivity, and gastrointestinal tract dysfunction” (Ko et al., 2016). The treatment for NAS can be a combination of drug therapy and non-pharmacological interventions, but a standardized treatment is lacking. A review of this literature aims to evaluate the available interventions that lead to decreased symptom severity, reduction of length of hospital stay, and a reduction in the use of drug therapy. As a result of the literature review, the nurse researcher supports the standardization of treatment and consistent use of non-pharmacological interventions by nurses to reduce withdrawal symptoms and as an adjunct to drug therapy.

This author recommends future research to be used to understand how consistently NICU nurses use non-pharmacological interventions. A question arose from the literature review: What are the most common non-pharmacological interventions used by NICU nurses as part of their institutional protocols? A pilot study with a mixed-methods approach will analyze how NICU nurses around the San Francisco (S.F.)Bay Area implement their facility’s NAS protocols. The nurse research will create a survey with open-ended and closed-ended questions. Furthermore, it will be analyzed using descriptive and content analysis. The study will intend to help nurses in three ways: practice effective and consistent non-pharmacological interventions, increase confidence in caring for newborns affected by NAS and be acquainted with protocols among Bay Area hospitals.

Key Words: *neonatal abstinence syndrome, morphine, cuddling, rooming-in, volunteer, and standardization.*

ACKNOWLEDGEMENTS

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INTRODUCTION

The use of prescription and illicit opioids in the United States (U.S.) is a growing burden on the healthcare system. Within a short period, "the number of women with opioid use disorder at labor and delivery more than quadrupled" (Ko, Haight, Tong, Bohm & Callaghan 2018 pg. 845). This rise of opioid use disorder has risen due to the excessive prescriptions and the challenges in accessing treatment to control pain (Ko et al.). The misuse of opioids during pregnancy leads to poor prenatal care, which results in preterm birth, low birth weight (LBW), neonatal abstinence syndrome (NAS), and respiratory depression (Feder, Letourneau, & Brook, 2018 pg.1). The characteristics of NAS can vary depending on the woman's gestational age and other factors that can increase the severity of symptoms.

Problem Statement

Opioid use during pregnancy can have detrimental effects, making this topic valuable to nursing practice. The rising incidence of NAS has prompted many healthcare professionals to develop different care methods for the newborn. Nurses are at the forefront of care for infants with NAS. Nurses need to know what other treatments are available for their patients. They also need to understand how to optimize outcomes for neonates with NAS.

Problem Question

This thesis aims to answer these questions: How do pharmacological and non-pharmacological interventions affect newborns diagnosed with neonatal abstinence syndrome? What are the best practices to treat NAS? This literature review will evaluate care and current practices that have shown beneficial outcomes for the newborn.

LITERATURE REVIEW

Introduction

Neonatal Abstinence Syndrome in the neonate manifests as withdrawal symptoms from the mother's use of opioids during pregnancy. A review of the literature will help to understand the treatment approaches for NAS. In this paper, the nurse researcher has reviewed six primary articles to analyze. The purpose of the review is to evaluate neonatal abstinence syndrome practices that lead to beneficial outcomes for the infant. This literature review was organized under two headings: management of treatment and types of treatment. The investigation produced many articles; therefore, the headings were subdivided into subheadings: assessment tool, predictive factors, standardization of treatments, cuddling, drug therapy, and rooming-in. The articles reviewed were located from Dominican University Archbishop Alemany Library database: CINAHL and PubMed from the years ranging from 2000-2021. An attached literature review table is added at the end of the paper. (Appendix A)

MANAGEMENT OF TREATMENT

Assessment Tool

The first step of the nursing process is an assessment which forms the basis of the care plan. The traditional Finnegan Neonatal Abstinence Scoring Systems (FNASS) was developed in the 1970s. The infants symptoms are assessed which then a score is given and possibly pharmacological management. Healthcare providers widely accept the FNASS tool as the gold standard for evaluating NAS symptoms.

In a study conducted by Grossman, Lipshaw, Osborn, & Berkwitt (2018), a new tool was developed to assess infants. This new tool will aim to evaluate the withdrawal symptoms and

decrease the use of pharmacological treatment. The researchers of this study believed that using the FNASS tool commonly leads to drug therapy.

The American Academy of Pediatrics (AAP) made recommendations based on research indicating the first line of defense for NAS is to focus on non-pharmacological interventions. Grossman et al. (2018) designed the Eat, Sleep, Console (ESC) as a non-pharmacologic intervention for NAS. This ESC tool would assess the newborn in a less intrusive way compared to the FNASS. The focus is to provide swaddling, on-demand feeding, and a low stimulation environment (Grossman et al., 2018).

The study design was a retrospective comparative study (quantitative) of 50 opioid-exposed infants. The procedure was conducted over 17 months in the well-newborn nursery. The symptoms were managed by using the ESC approach while at the same time gathering FNASS scores every 4 hours. The FNASS scores "were not used to guide medical decision making regarding the initiation of pharmacological treatment" (Grossman et al., 2018 p. 2).

The ESC approach asked three critical questions: Is the infant eating more than an ounce at each feeding? Can the infant sleep one hour or more? And can the infant be consoled within 10 minutes? If these answers were all "yes," then the infant was considered stable, and no further interventions were necessary. If one of these questions was a "no," interventions were strongly recommended: feeding on demand; swaddling and holding; low stimulation environment, and parental presence.

The study results revealed that only six infants (12%) were treated with morphine using the ESC approach, in contrast to 31 infants (62%) treated with morphine using the FNASS approach. Overall this innovative approach reduced the use of morphine in infants and successfully reduced the average length of stay (LOS) in the hospital without any severe outcomes or readmissions.

The study had some limitations, including the inability to randomly assign patients into the FNASS group or the ESC group, causing the failure to compare the approaches'. Scoring for FNASS by different nurses was problematic, as each nurse has a different perspective on each infant's sign and symptoms.

The study proved that assessing infants with NAS by meeting the physiological needs of the newborn, instead of waiting for symptoms to manifest, is a more beneficial approach. Hospitals can lead the way by implementing this new assessment approach, leading to a guide for safe treatment and new protocols for infants with NAS.

Predictive Factors

Since 1972, methadone, known as a fundamental treatment for opioid drug dependence, has been used during pregnancy. In the surge of the opioid crisis, the United States approved buprenorphine, a maintenance medication, to treat opioid addiction. In the U.S, both methadone and buprenorphine are considered safe drugs to use to treat opioid dependence in pregnancy.

In a study conducted by Kaltenbach et al. (2012), *Predicting Treatment for Neonatal Abstinence Syndrome in Infants Born to Women Maintained on Opioid Agonist Medication,* the objective was to analyze the factors that had the potential to increase the severity of NAS while receiving methadone or buprenorphine to treat opioid addiction.

The study design was a double-blind, double-dummy, flexible dosing, randomized clinical trial. The factors used to identify severity included: maternal weight at delivery, estimated gestational age, infant birth weight, delivery type, maternal nicotine use, days of maternal study medication received, and psychotropic medication during pregnancy.

During the clinical trials, all mothers received thorough treatment for substance abuse and prenatal care. The participants included 131 infants, of which two became ineligible because of unexpected death and prematurity. The procedure to monitor the severity of NAS consisted of a nurse trained as an expert-rater. These nurses received extensive training every six months, and they were placed in all the medical sites. The expert-rater observed symptoms and scored the infant every four hours with a modified Finnegan scale. In participants treated for NAS (68 infants), about 53% required medication (morphine). The *predictive factors* such as infant weight and nicotine use before birth increased the use of drug therapy treatment and consequently increasing LOS.

Kaltenbach et al. (2012) aimed to analyze the factors that increase NAS treatment severity while the mother is treated for opioid addiction. Researchers concluded that during the 41 months of the clinical trial, specific variables could alter treatment for opioid dependence. A high infant birth weight increased the probability of requiring treatment. Previous studies showed a relationship between estimated gestational age and higher infant birth weight would increase NAS symptoms.

The total amount of morphine used to treat infants was linked with fewer maternal receipt of study medication, consequently increasing LOS (Kaltenbach et al. 2012). The maternal mother's exposure to nicotine (cigarettes smoked during the 24 hours before delivery) was a significant predictor in the infant's treatment of NAS and the dose of morphine to treat NAS. The NAS scores were higher in infants with mother's use of SSRIs (antidepressants), requiring more significant amounts of morphine.

There were some limitations in the study, such as not examining the role that illicit opioids have on the expression of NAS that would require medication. It was not determined how many

newborns received breastfeeding, and it is unknown what role breastfeeding has on NAS. The study did not condense drug classes to make specific conclusions on the severity of NAS. Further research is needed to examine specific SSRIs and the severity of NAS development.

This study's strength was the training of expert-raters throughout the study's entirety, resulting in good management accuracy. This article is relevant for the guidance of treatment because it was able to identify factors that increased the severity of NAS. This study will help develop interventions during the prenatal period to educate mothers regarding the factors that can increase NAS's severity. Physicians and nurses can also plan with the mother to modify factors such as nicotine use, delivery type, and maternal weight.

Standardization of Treatments

During this opioid epidemic, it is helpful to put forward the need for standardizing treatment for NAS. Although The American Academy of Pediatrics advises institutions to implement standardization of treatment of NAS, "single-institution prospective studies are lacking regarding the success of this approach"(Burnette, Chernicky, & Towers, 2019. p. 3415). In a study by Burnette et al. (2019), researchers developed a strict NAS management protocol. The study's objective was to analyze infant responses and LOS of neonates treated for NAS after initiating a strictly standardized treatment protocol.

This study sample and design was a prospective cohort that collected neonatal outcome data before and after implementing a strict NAS morphine weaning treatment protocol. The participants were a total of 395 neonates treated for NAS during the study. The research was conducted over 30 months, with the principal outcome being the length of stay.

The results concluded that LOS before the institution of the protocol was 23.31 LOS days (on 233 neonates), and after the initiation of protocol, 18.17 LOS days (on162 neonates). The difference was 5.14 LOS days less for neonates treated under the strict protocol. The management before the strict protocol was led by the neonatologist, who determined the weaning process. Once the strict protocol was initiated, the weaning process was driven by the Finnegan score. This established consistency in management from the start. Another change in the strict protocol involved the use of "PRN" for morphine. Before the change, newborns who were being treated with morphine and did not show improvement could have morphine increase. After initiation, morphine was given as needed, or "PRN" to reduce the number of incidents before an increase of morphine.

This study's limitations were that many of the subjects were primarily Caucasian, and results can vary from populations with a higher mix of African American or Hispanic races. There was some inconsistency with the opioid used by the mothers, the most common being buprenorphine, and others such as methadone or heroin, which can create inconsistencies with the expressions of NAS. Although drug screening was periodically done during gestation and delivery, there is no way of truly knowing the specific drugs or poly-substance or intermixing to interpret accurately.

The strength of this study is the collection of data that affected LOS and the large cohort study from the same hospital. Researchers successfully implemented a strict NAS treatment protocol that demonstrated a reduction in LOS. This study can guide hospitals to implement standardized treatment protocols for NAS and provide better outcomes for neonates.

TYPES OF TREATMENTS

Cuddling

The approach to initiate treatment for newborns is non-pharmacological. There is considerable data provided by research on the different pharmacologic interventions, but a basis is a non-pharmacological approach. "Common methods of non-pharmacological care include swaddling, positioning, quiet and dimly lit rooms, rooming-in, skin-to-skin contact, breastfeeding, and infant positioning" (Mangat, Schmölzer, & Kraft, 2019). In this review, the nurse researcher chose an original study that required a volunteer cuddler. The feasibility of implementing the program was later assessed by interviewing both nurses and volunteers.

In October 2015, a study program in Toronto, Canada, conducted by Hignell et al. (2019), was launched to analyze the effects of cuddling infants that required treatment for NAS. The purpose of this study was to assess the impact of cuddling infants cuddled by trained volunteers and the effects of LOS. Researchers collected from two groups: 14 infants in the control group and nine infants in the cuddling program.

The study was a mixed-method technique with retrospective data collection. The researchers used the control group to measure the practicality of implementing a cuddler program. Cuddling was introduced as a standard of care for all infants and gave infants the needed support when families could not be present.

A group of trained volunteers were assigned to identify the need for comfort and overstimulation. Volunteers cuddled the infants in the sitting or standing position while engaging them with singing, reading, or talking. Newborns who could not leave the incubator due to medical fragility were comforted by the volunteers holding them through the window of incubators.

The study's limitation was that it could not compare the types of opioid exposure between the two groups. There was also an inconsistency with the amount of cuddling time each infant received. There are significant gaps in research on specific supportive care, such as cuddling.

The study's strength was that it produced a reduction in LOS for the intervention group by six days compared to the control group. Although the sample size was small, the study was conducted over two years, demonstrating the impact that cuddling has on LOS.

The implementation of this new program created data from actual experiences through volunteers, nurses, and family members. Cuddling was an overall positive outcome for the infant as supportive care, resulting in reduced drug therapy. Many hospitals implement a variety of supportive care before implementing drug therapy. Current treatments such as breastfeeding, swaddling, rooming-in, skin-to-skin, quiet and dim rooms, and soothing techniques can be implemented while cuddling the infant.

Drug Therapy

There are various pharmacological treatments for NAS, but for this review, the nurse researcher chose the most common: methadone and morphine. In a *Comparison of Safety and Efficacy of Methadone vs. Morphine for Treatment of Neonatal Abstinence Syndrome* (Davis et al., 2018), the researcher's objective was to identify which medication was more effective in the treatment of NAS.

The sample population included 117 infants in a randomized, quantitative, double-blind, intention-to-treat clinical trial. Mothers treated for substance abuse qualified to have their infant be randomly treated with morphine or methadone for pain control. The FNASS was used for assessing the infants' symptoms every four hours. The treatment protocol, which lasted 25 months, implemented drug therapy if the infant scored eight or higher two consecutive times on

the FNASS. A one-time score of 12 higher would also initiate drug therapy. Researchers randomly assigned methadone every 8-hours or morphine every 8-hours, with an additional placebo alternating every 4 hours between opioid treatment. The study team also implemented the use of phenobarbital if the infant did not respond to treatment after morphine had been increased. Although, phenobarbital was not considered part of the study.

Once the infant obtained a lower Finnegan score (generally <8), weaning from methadone or morphine was initiated by 10% every 12-48 hours. Once the infants' dosage reached 20% of the initial dose, treatment was stopped, and they were observed for 48 hours before discharge.

The researchers acknowledged that they did not meet the recruitment goal for three reasons. First, there was a 14-month delay in the study due to the development of the protocol. Secondly, mothers declined to enroll infants because they were also treated with methadone for maternal opioid addiction. Lastly, many sites began to implement non-pharmacological interventions, which reduced pharmacological treatment.

The strengths of this study include a multisite comparison and assessing quickly and control signs of NAS. This study showed that the use of methadone was more effective in decreasing the LOS and the length of treatment (LOT) compared to morphine. Currently, the FDA only makes recommendations to treat opioid dependence for pregnant mothers and not for neonates. Current drug therapies for neonates with NAS are essential for nurses to understand the outcomes and benefits.

Rooming-In

Nursing interventions are the actions and treatments that nurses carry to support patients in meeting their set goals. A type of non-pharmacological intervention for NAS is the *rooming-in* approach, intended to keep the newborn with their mothers during the withdrawal stage. Cree,

Jairath, & May (2019), researchers of *A Hospital-Level Intervention to Improve Outcomes of Opioid Exposed Newborns,* worked on a quality improvement project for a single site at Wellspan Health York Hospital. The study aims to determine if non-pharmacological strategies, such as the rooming-in approach, effectively care for the infants at risk of developing NAS and if this approach will reduce LOS and drug therapy use. Rooming-in allows the newborn to stay with the mothers in the hospital room throughout the initial hospitalization. They are then provided a private room on the pediatric floor for continued care and non-separation of mother and newborn while monitoring for NAS.

The sample size for this study included 88 infants that met eligibility requirements for inclusion in the study. The study's design and methods were a retrospective chart review that compared 48 infants in the control group exposed to methadone and buprenorphine in utero before implementing the rooming-in approach. Researchers then compared 40 infants in the intervention group with the same exposure in utero. In the intervention group, infants requiring drug therapy were transferred to the pediatric floor for further monitoring instead of the NICU.

Before implementing rooming-in, the admission rate for NAS in the NICU was 100%. After implementing rooming-in, the admission rate dropped to only 7.5%. The LOS decreased from 14 days to 10.1 days post-implementation. There was also a significant finding in the total length of drug therapy, which fell from 15.98 days to 9.71 days post-implementation.

A single-center study and a small sample size present some limits to diverse populations and settings. There was also some exclusion of tobacco and other illicit drugs in data that previous studies have shown to increase the severity of NAS. Providers could not establish a process to begin weaning from drug therapy which created inconsistencies in care. Newborns that required drug therapy were admitted to the pediatric floor, but this became a challenge for mothers' who

were still inpatients. This challenge made it difficult for mothers' to room with their babies.

Systematically identifying newborns at risk for NAS gave this study a strength. The staff's willingness to change their practice and manage NAS infants helped increase the study's quality. Overall, rooming in the pediatric unit reduced LOS and NICU costs and allowed the mother to care for her newborn while receiving treatment.

Rooming-in addresses the issue of care settings in hospitals across the U.S. Caring for a newborn with NAS on a pediatric floor can be ideal. Still, rooming-in would be limited to specific hospitals. NICU nurses are responsible for caring for infants who need more acute care, and the study concluded that caring for infants in the inpatient pediatric floors can be safely managed. Research has shown that skin-to-skin decreases restlessness and respiratory distress and enhances engagement and breastfeeding while at the same time stimulating maternal-infant bonding (Ryan, G., Dooley, J., Gerber Finn, L., & Kelly, L. 2018). By implementing the rooming-in approach, infants can benefit from skin-to-skin contact ("kangaroo care") and breastfeeding (if not contraindicated). Further research is needed in hospitals that do not have pediatric units.

DISCUSSION OF LITERATURE REVIEW

While analyzing the literature, I have seen that all the studies aim to reduce the severity of withdrawal symptoms in the newborn. Whether the treatment is in utero (for the mother) or after birth, researchers are working toward finding the most promising approach to treat neonates exposed to opiates. While pharmacological interventions are needed for severe symptoms, nurses and volunteers can implement non-pharmacological interventions to reduce symptom severity. Non-pharmacological interventions, such as feeding on demand, swaddling, and a low stimulation environment can all also decrease the length of stay and reduce the length of drug

treatments.

Multi-site research is needed on the most effective non-pharmacological interventions that are used as treatment protocols. While searching for the volunteer cuddling interventions, I found a 20-year gap in research that pointed to the need for complementary interventions. There is extensive research on drug therapy for both the mother and the infant, but non-pharmacological interventions are lacking. The American Academy of Pediatrics recommends the standardization of treatment for NAS, which has significantly improved neonatal response and decreased LOS (Burnette et al., 2019). Nurses are at the forefront of care; therefore they will benefit from understanding the initial interventions that can potentially decrease the severity of NAS.

PROPOSAL FOR FURTHER STUDY

Research Question

The purpose of this literature review was to evaluate both non-pharmacological and pharmacological interventions for newborns affected by neonatal abstinence syndrome and the best practices to care for them. A thorough review of the literature identified that many hospitals practice a variety of non-pharmacological interventions. I want to identify the specific techniques that are implemented among NICU nurses. The question I will aim to answer is: what are the most common non-pharmacological interventions that NICU nurses practice as part of their institutional protocols?

Rationale For Study

The purpose of this study will help to identify similarities and differences in non-pharmacological interventions among NICU nurses in the Bay Area. Identifying these interventions will help nurses practice effectively and consistently while increasing confidence in

caring for newborns affected by NAS. Hospitals can use this proposal to determine the consistency or inconsistencies and generate treatment protocols for the Bay Area.

Theoretical Framework

The Theory of Comfort, developed by Katherine Kolcaba in 1990, is a framework that places comfort in the frontline of healthcare. According to Kolcaba, comfort is found in three states: relief, ease, and transcendence. By implementing the theory of comfort to this proposal, we can identify both pharmacological and non-pharmacological interventions for any patient. Through pain medications, patients can experience relief comfort. Ease of comfort is attained through the patients' experience of contentment, for example, the easing of anxieties. Kolcaba explains transcendence as a state "in which patients can rise above their challenges" (2019, p. 6). In other words, the patient reaches a point where they established a sense of comfort that cannot be measured or understood.

Nurses can supply a variety of comfort measures for patients and families. Through the nursing process, we can provide interventions that will address symptoms and the whole person. The nursing process was designed to make changes according to the patient's condition. In the care of infants with NAS, nurses will monitor and assess these changes because symptoms of withdrawal do not immediately develop. At the same time, we can implement interventions for the infant to decrease the severity of withdrawals. Making our little patients comfortable in every way is the responsibility of nurses'. The theoretical framework of comfort will guide this research.

Sample

The study population and eligibility criteria will only include registered nurses (RN's) working in the NICU around the Bay Area. We will use a snowball strategy to recruit nurses by

sending out the survey through an online platform. The Likert survey will be created using Qualtrics, which can easily circulate online through social media for further recruitment. The sample size needed for this pilot study is 30-50 nurses or five per institution. A sample questionnaire is provided in Appendix B.

Methods

I will use a cross-sectional mixed-methods approach to evaluate both quantitative and qualitative effects. The study will use a Likert survey with 25 questions with closed-ended and open-ended questions. Descriptive statistical analysis will interpret the quantitative data to find commonality and frequency. An analysis of variance (ANOVA) will be used to compare and a multiple regression will be applied to control for extraneous variables. For qualitative data, content analysis will be employed to establish the relationships between certain words, themes, or concepts. The mixed-methods design will produce a more thorough understanding of the practices of NICU nurses.

Ethical Considerations

The ethical considerations for this study will include voluntary informed consent. The proposal will be reviewed by the institutional review board (IRB) of Dominican University. Nurses will also have the right to withdraw from the study at any time. Participants' data will remain strictly confidential on a password-protected computer. The survey will impose a burden of time on the nurse of 15-20 minutes.

CONCLUSION

There are numerous studies on the effectiveness of drug therapy for infants that require treatment. The U.S. Federal Drug and Food Administration (FDA) has not approved a specific drug therapy for infants. Nevertheless, morphine is the most commonly used drug for NAS treatment when symptoms are not well controlled. Therefore, initiating non-pharmacological treatment is pivotal in treating NAS to reduce symptoms, reduce the length of hospital stay, and reduce the use of drug therapy.

The proposal for further research is intended for the specialized practices of NICU nurses. The intention will be to understand the most effective non-pharmacological interventions that are part of the hospital's protocols. Novice nurses beginning in the NICU will learn many new skill-sets. This literature review will allow both novice and experienced nurses to gain knowledge about effective intervention so that they can implement new practices.

Preventing Neonatal Abstinence Syndrome (NAS) can only be accomplished by the mother refraining from opiates and other drugs during pregnancy. Substance abuse disorder is a global epidemic that requires a large-scale collaboration between public health officials, family agencies, and advocates. In the meantime, researchers and healthcare providers will continue to study the effects of NAS and effectively care for these infants.

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APPENDIX A: LITERATURE REVIEW TABLE 1

Authors/Citation	**Purpose/Objective of Study**	**Sample - Population of interest, sample size**	**Study Design**	**Study Methods**	**Major Finding(s)**	**Strengths**	**Limitations**
Kaltenbach, K., Holbrook, A. M., Coyle, M. G., Heil, S. H., Salisbury, A. L., Stine, S. M., . . . Jones, H. E. (2012). Predicting treatment for neonatal abstinence syndrome in infants born to women maintained on opioid agonist medication. *Addiction, 107*, 45-52. doi:10.1111/j.1360-0443.2012.04038.x	To identify variety of factors that predict neonatal abstinence syndrome.	131 newborn born to opioid dependent mothers	Randomized clinical trial; double blind, double dummy	Infants were observed for 10 days to compare the benefits of methadone versus buprenorphine for the treatment of opioid dependence during pregnancy	The study found gestations age, mothers weight at delivery, delivery type, infant weight, nicotine use, the use of SSRI's and the days in which the mother participated with the study medications played a role in the severity of neonatal abstinence syndrome who were exposed to methadone or buprenorphine.	This study was able to assess newborns who were exposed to methadone vs. buprenorphine.	Unable to identify maternal use of illicit drugs. Unable to examine the role of breastfeeding or the days breasted, as some of the study samples chose to breastfeed. Unable to examine the variety of drugs prescribed to mothers limits the ability of conclusions.
Davis, J. M., Shenberger, J., Terrin, N., Breeze, J. L., Hudak, M., Wachman, E. M., . . . Lester, B. **(**2018). Comparison of Safety and Efficacy of Methadone vs Morphine for Treatment of Neonatal Abstinence Syndrome. *JAMA*	To compare the safety and benefits of methadone and morphine for neonatal abstinence syndrome	117 Infants were randomly treated with methadone or morphine.	Randomized double blind intention-to-treat clinical trial.	Mother's that had received buprenorphine, methadone or opioids qualified to have their infant to be randomly treated with morphine or methadone for pain control. Infants were assessed using the Finnegan Neonatal Abstinence Syndrome	Methadone was found to be more effective than morphine as a pharmacologic treatment for infants diagnosed with neonatal abstinence syndrome. Treatment with methadone had a shorter length of stay (14%) compared to morphine.	This study offers evidence based implications for the pharmacological treatment of neonatal abstinence syndrome.	Unable to meet recruitment goal

Pediatrics, 172(8), 741. doi:10.1001/jamapediatrics.2018.1307							
Grossman, M. R., Lipshaw, M. J., Osborn, R. R., & Berkwitt, A. K. **(**2018). A novel approach to assessing infants with neonatal abstinence syndrome. *Hospital Pediatrics*, *8*(1), 1-6. doi:10.1542/hpeds.2017-0128	The development of a novel assessment approach and describing its effect on the management of infants with NAS.	50 infants on the inpatient unit at the Yale new Haven Children's Hospital that had been exposed to opiates	A retrospective comparison of treatments	The study methods compared two different approaches to opioid exposed infants: FNASSF and ESC approaches. The traditional method of the Finnegan Neonatal Abstinence Scoring (which uses a score of greater than 8 to initiate pharmacological treatment). The Eat, Sleep, Console (ESC) approach focused on the essential function of the newborns without interruptions.	Using the new ESC approach decreased the use of Morphine to treat NAS, compared to using the FNASS approach. The new ESC approach was effective in managing infants with NAS while limiting pharmacologic treatment.	Implementing a new approach, ESC, for the management of opioid exposed infants.	Randomly assigned patients into FNASS and ESC groups which rendering the inability to compare the approaches to the length of stay. Reliability of Finnegan Scores among all the different nurses. Possibly readmission of discharged infants, however most NAS

Hignell, A., Carlyle, K., Bishop, C., Murphy, M., Valenzano, T., Turner, S., & Sgro, M. (2019). The Infant Cuddler Study: Evaluating the effectiveness of volunteer cuddling in infants with neonatal abstinence syndrome. Paediatrics & Child Health, 25(7), 414-418. doi:10.1093/pch/pxz127	To assess the practicality and the impact of trained volunteers cuddling program on the length of stay for infants born with NAS.	Data was collected from 14 infants enrolled in the pilot study cuddling program	A qualitative and quantitative study with a retrospective control group.	Mixed methods. Pilot cohort study with retrospective control group and a prospective data collected for intervention group	Length of stay was reduced by 6.36 days for infants in the pilot program and the volunteers reported a positive impact of cuddling program on infants, families, staff and volunteers alike	Intentions of providing comfort to infants and feedback on a non-pharmacological intervention with neonatal abstinence syndrome.	Inability to provide data on the different opioid exposures between the two groups. Wide variability in the amount of cuddling time received by each infant.
Burnette, T., Chernicky, L., & Towers, C. V. (2019). The effect of standardizing treatment when managing neonatal abstinence syndrome. *The Journal of Maternal-Fetal & Neonatal Medicine, 32*(20), 3415-3419. doi:10.1080/14767058.2018.1465038	To evaluate overall newborn response and length of stay (LOS) of neonates treated for NAS following the institution of a strict standardized treatment protocol.	The sample population: A total 395 Neonates being treated for NAS	A prospective cohort study by collecting data.	Collecting neonatal outcome before and after the standardization of a strict NAS morphine weaning treatment protocol.	The study found that by initiating a standardized NAS treatment protocol it can improve neonatal response and decrease length of stay.	Prospective data collection	Study population was primarily Caucasian and results can vary is compared with populations that have a higher mix of African American or Hispanic races. Most frequent drug seen was buprenorphine. Does not prove that the strict use of morphine weaning protocol used at the institution should be adopted.

Cree, M., Jairath, P., & May, O. (2019). A hospital-level intervention to improve outcomes of opioid exposed newborns. *Journal of Pediatric Nursing, 48,* 77-81. doi:10.1016/j.pedn.2019.07.009	Will adding rooming-in to care for newborn affected or at risk of NAS reduce length of stay and reduce the need for drug therapy	70 infants exposed to methadone or buprenorphine in utero	Retrospective chart review	Charts were reviewed before implementation of intervention and after intervention	Reduction of length of stay and total length of pharmacological treatment	Process of identification of infants born with NAS using the EHR	A single center study Small sample size Exclusion of exposure of other substances. Hospital setting or layout to transition mother and infant to same room.

APPENDIX B-Research Instrument

LIKERT SURVEY

Age: _____

Gender:_____

Ethnicity:_____

College Level:_____

Years as NICU Nurse:_____

Are you currently working at a NICU Nurse? Yes / No

If no, you are not working in a NICU, how many years has it been since you worked in that setting? _____years.

Directions: Please answer the following questions that most accurately reflect your opinions.

1. In your opinion, does your place of employment successfully care for infants born with neonatal abstinence syndrome?

   0 [Strongly Disagree]

   1[Disagree]

   2[Neither Agree or Disagree]

   3[Agree]

   4[Strongly Disagree]

2. Does your hospital regularly pre-screen mothers for opioid use?

   0 [Strongly Disagree]

   1[Disagree]

2[Neither Agree or Disagree]

3[Agree]

4[Strongly Disagree]

3. How often do you use the Eat, Sleep, Console (ESC) assessment tool?

   0 [Strongly Disagree]

   1[Disagree]

   2[Neither Agree or Disagree]

   3[Agree]

   4[Strongly Disagree]

4. How often do you use the FNASS or modified Finnegan Scale assessment tool?

   0 [Strongly Disagree]

   1[Disagree]

   2[Neither Agree or Disagree]

   3[Agree]

   4[Strongly Disagree]

5. Does your hospital recruit volunteers to help with feeding, cuddling, or consoling infants with NAS in the NICU?

   0 [Strongly Disagree]

   1[Disagree]

   2[Neither Agree or Disagree]

   3[Agree]

   4[Strongly Disagree]

6. Do you believe that having volunteers would be more effective in assisting you with the care of an infant with NAS?

   0 [Strongly Disagree]

   1[Disagree]

   2[Neither Agree or Disagree]

   3[Agree]

   4[Strongly Disagree]

7. Do parents regularly participate in the care of infants being treated for NAS?

   0 [Strongly Disagree]

   1[Disagree]

   2[Neither Agree or Disagree]

   3[Agree]

   4[Strongly Disagree]

8. If your hospital offers rooming-in for infants with NAS, can you describe the protocol for this procedure? Please explain._____

9. If your hospital uses the ESC approach does it effectively control withdrawal symptoms? Please describe._____

10. If your hospital uses the FNASS tool does it effectively control withdrawal symptoms? Please describe._____