# IMPLEMENTING A NEONATAL ABSTINENCE SYNDROME TOOLKIT TO IMPROVE NURSE SELF-EFFICACY AND KNOWLEDGE

By

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#### Abstract

Long-term in-utero exposure to opioids creates immediate withdrawal symptoms for the newborn upon delivery. Infants diagnosed with Neonatal Abstinence Syndrome (NAS) require extensive monitoring and highly-skilled care, resulting in longer length of stay (LOS) and immediate admittance to the neonatal intensive care unit (NICU). This project is a standardized approach for NICU nursing staff to implement evidence-based nursing interventions for infants with NAS, resulting in increased self-efficacy, improved knowledge about NAS, and reduced NAS admission stays. A literature review identified non-pharmacological nursing interventions presented to front-line nurses in a structured format increased optimal infant outcomes. Dorothea Orem's self-care deficit theory and Hildegard Peplau's theory of interpersonal relations guided this project. The Iowa model supported the implementation of the project. Motivational interviewing (MI) training that promotes reflective nursing practice and encourages non-judgmental interactions with NAS families was provided. A training NAS toolkit was developed based on the Indiana Perinatal Substance Use Practice Bundle and a pre and post-training assessment survey called The Assessment of Nursing Knowledge and Self-Efficacy Related to NAS (ANKS) as administered to determine baseline knowledge and an increase in self-efficacy and knowledge. Descriptive statistics and a repeated measures ANOVA were used to analyze the data. Both self-efficacy and knowledge levels improved. Self-efficacy scores improved by .85 points after training. The number of correct responses for knowledge questions increased post-training. Given the complexity of care of a NAS infant, specialized training for NICU nurses optimizes the chance for better neonatal outcomes.

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#### **Chapter I: Introduction**

An increase in the number of pregnant women addicted to opioids in Indiana has led to the need for structured Neonatal Intensive Care Unit (NICU) nursing education to treat infants experiencing withdrawal symptoms. Families with infants diagnosed with neonatal abstinence syndrome (NAS) also need knowledge about anticipated infant behavior and treatment protocols. These circumstances present an opportunity for an informed and knowledgeable nurse to convey valuable patient education.

NAS is "a group of physiologic and neurobehavioral signs of withdrawal that may occur in neonates after utero substance exposure" (Larson et al., 2019, para. 3). According to the Substance Abuse and Mental Health Services Administration (2019), 50-80% of infants exposed to opioids will develop NAS. Although medication-assisted infant withdrawal treatment is considered the standard protocol, current evidence validates the merit of non-pharmacologic interventions, such as family rooming in with the infant as opposed to spending the majority of the time in the NICU, motivational interviewing (MI) with the caregiver(s) at the bedside, and the eat, sleep, console method for infant well-being, and supportive education about breastfeeding, (Grishham et al., 2019; Madson et al., 2016).

One objective for this Doctor of Nursing Practice (DNP) project was to provide a format to introduce non-pharmacological interventions in a holistic approach to increase families' interactions with infants with NAS and to promote a better understanding of NAS among these families. To facilitate this objective, a NAS toolkit was designed as a resource for new nurses being orientated in the OB specialty. It included the program information and resource materials for interdepartmental support, such as behavioral health and community health experts.

A second objective for this DNP project included an educative component developed for front-line nursing staff members to be incorporated in the maternal/child department's annual competencies. Additionally, an annual competency was developed to allow nursing staff to maintain or refresh their knowledge base about NAS content including, MI, subjective neonatal abstinence scoring, smoking cessation recommendations, and non-pharmacologic nursing interventions. The annual competency consists of a review of the NAS toolkit materials followed by an exam administered by the NICU clinical educator.

# **Statement of Problem**

Prolonged stays associated with a NAS diagnosis in the NICU have led to the need for standardized nursing interventions for NAS treatment (Cook et al., 2017; Cook & Fantasia, 2019; Grossman et al., 2017; Teague et al., 2015). Accurate care of the NAS infant requires nurses to be knowledgeable about the condition, evidence-based nursing interventions, available resources, and to maintain a developed skill-set to provide quality care.

Infants diagnosed with NAS do not exhibit typical newborn characteristics, and an accurate assessment of symptoms can be a daunting task for novice nurses. The NAS infant may suffer seizures, overactive reflexes, tight muscle tone, excessive crying, poor feeding, slow weight gain, respiratory distress, gastrointestinal complications, disrupted sleep patterns, persistent nasal congestion, and sneezing (Corr & Hollenbeak, 2017). Standard medical management of these infants aims to minimize the symptoms of opioid withdrawal. Most of the studies that have been conducted for the care of NAS newborns

are focused primarily on pharmacologic management and not the supportive nonpharmacologic nursing interventions. Evidence supports standardization of nursing care, including decreasing environmental stimuli and recognizing the signs of agitation before the infant becomes inconsolable (Teague et al., 2015). This DNP quality improvement project highlighted evidence-based protocols that promoted a standardized assessment of infants with NAS and non-pharmacological interventions.

This scholarly project focused on developing an evidence-based NAS toolkit for NICU education to increase self-efficacy and knowledge of the nursing staff, thus impacting the length of stay of NAS infant admissions. The NAS toolkit was designed to eliminate inconsistencies in bedside NAS nursing care practices.

#### **Purpose/Aim of the Project**

This DNP project implemented a structured learning experience for the NICU nurse about recognizing NAS symptoms, the use of a subjective neonatal abstinence scale, learning non-pharmacologic consoling protocols, utilizing MI tips, recommending smoking cessation and demonstrating the benefits of NAS infants rooming in with the family during the hospital stay. After implementing a standardized approach to staff training, the overall knowledge base and self-efficacy about NAS increased. Engaged staff participation in the training increased self-efficacy in the nurses, thus promoting positive patient outcomes and working to decrease the number of days the infant spent in the NICU.

Before introducing the NAS toolkit training and the documentation module in the electronic medical record (EMR), the expectation was that NICU nurses teach themselves assessment basics based on personal experience with NAS infant interactions. There was

not a standard method of documentation for parent teaching and no suggested options of evidence-based interventions that promoted family bonding.

# Background

Nationwide, addiction to opioids affects vulnerable populations, including pregnant women and their infants. "From 2004 to 2014, the incidence of NAS in the United States increased by 433%, from 1.5 to 8.0 per 1,000 hospital births" (Jilani et al., 2019, para. 1). In response to these rising statistics, the Protecting Our Infants Act of 2015 became law on November 25, 2015. The Public Law 114- 91 requires the United States Department of Health and Human Services to address problems related to prenatal opioid exposure, review gaps in programs, and develop recommendations for prevention and treatment of opioid use during pregnancy (Substance Abuse and Mental Health Services Administration, 2019). Individual states are becoming proactive in addressing the gaps in knowledge about NAS through interdisciplinary efforts, perinatal learning collaboratives, and quality improvement initiatives. The implications of these trends for the care of infants with NAS and the burden of costs for the families and the healthcare system are significant (Winkelman et al., 2018).

#### Significance of the Project

According to Cook et al., (2017), implementing evidence-based education strategies to front-line staff members can standardize care, decrease the potential for misinformation, and create a positive learning environment for all involved with the care of infants with NAS. The current method for identifying and managing the nursing care of an infant with NAS does not account for individual differences in the interpretation of signs and symptoms of neonatal withdrawal. Optimal outcomes are associated with standardized staff education about NAS, including etiology, a standardized technique for scoring signs and symptoms of infant withdrawal, benefits of families rooming-in with the infant, smoking cessation counsel, MI techniques, and both pharmacologic and non-pharmacologic management (Indiana Perinatal Quality Improvement Collaborative, 2018; Wachman et al., 2018). Without consistent educational information distributed regularly to all staff members, the results could be altered by significant discrepancies of subjective neonatal abstinence scale scoring, ineffective non-pharmacologic interventions, increased pharmacologic treatments, and increased length of stays.

By educating nurses in a formal format, this DNP project decreased the variability in the content and improved maternal and infant outcomes by providing a solid foundation of reliable knowledge. This method increased staff compliance with family education and boosted confidence in discussing NAS nursing interventions.

# **Impact of the Project**

By introducing a new educational format, this DNP project streamlined during the hiring process, ensured consistency of content and current evidence-based protocols. Increasing the understanding of NAS by NICU staff promoted therapeutic dialogue between the families and the healthcare team (Cook et al., 2017). Encouraging family participation in the care of the NAS infant is correlated with shorter than the average length of stays in the NICU setting (Newman et al., 2015).

A NAS educative toolkit for staff members that delivers information about current, evidence-based NAS care promoted familiarity with non-pharmacologic therapies for NAS, such as consoling methods, benefits of rooming-in with parents, breast milk feeding, and hospital treatment protocols, and expected infant withdrawal behavior (Newman et al., 2015). The training ensured an increase in knowledge and correct use of the Modified Finnegan Neonatal Abstinence Scoring System Score Sheet. (D'Apolito & Finnegan, 2010) (see Appendix B) is consistent with reducing variance in subjective data, as this information guides treatment. The consequences of the wide variation in assessment techniques can result in unnecessary administration of pharmacologic intervention and longer length of stays. The ability of nurses to consistently apply the same standards with the Modified Finnegan Neonatal Abstinence Scoring System Score Sheet. (D'Apolito & Finnegan, 2010) (see Appendix B) leads to more accurate scoring, which provides improved management of the symptoms of the infant experiencing withdrawal.

#### **Chapter II: Literature and Theory Review**

The prevalence of opioid use during pregnancy has become a national concern resulting in a drastic escalation of infants diagnosed with an opioid-withdrawal condition called neonatal abstinence syndrome (NAS) (Jilani et al., 2019). This project aimed to introduce a new process for NICU nurses training regarding NAS content. The following databases used for the literature review, limited to the date published from 2015-2020, were PubMed, CINAHL Complete (EBSCO), Springer Link, Ovid, Elsevier ScienceDirect Journals, Wiley All Journals, SAGE Journals, ProQuest, and MEDLINE. Specific search terms used to refine the articles included: Neonatal Abstinence Syndrome (NAS) + Management, NAS + Treatment, NAS + Protocols, NAS + Eat, Sleep, Console, NAS + Nursing care, and NAS + Scoring tools, and NAS + Rooming-in. Literature was evaluated using the Critical Appraisal Skills Program (2018) (Appendix C).

# **Literature Review**

#### **Neonatal Abstinence Syndrome Community Repercussions**

A review of current literature signifies that "about 90 infants per day, or one every 15 minutes, are born physically dependent on opioids and may require various levels of intensive care to wean them from the drugs" (National Institutes of Health, 2021, para. 4). According to Krans and Patrick (2016), these compromised infants face a 50-80% chance of developing NAS on delivery. As the number of infants diagnosed with NAS continues to increase, it is expected that a NICU nurse will be caring for these infants and their families on a more regular basis.

The United States (U.S.) government's response to address this crisis was passing the Protecting Our Infants Act of 2015, which recognized the need for an organized framework to identify, develop, and implement a comprehensive assessment and treatment plan for infants exposed to intrauterine opioids and their mothers suffering from addiction. Additional findings by Ordean et al. (2017) revealed the national demographics of NAS-affected women of childbearing age, with 80% using Medicaid as primary insurance coverage in rural areas of the United States. This statistic reflects substantial public funding covering prolonged neonatal intensive care (NICU) admissions. In a study conducted by Corr and Hollenbeck (2017), annual U.S. costs associated with newborn withdrawal/exposure rose from \$61 million in 2003 to \$316 million in 2012. Research has identified that NAS infants suffer from inconsolable, highpitched crying, feeding difficulties, hypertonia, frequent watery stools, and respiratory problems (Conradt et al., 2019). These circumstances lead to prolonged NICU admissions that result in higher organizational and family costs of specialized care.

# **Neonatal Abstinence Syndrome Family Repercussions**

The unmet needs of children cannot be addressed without first meeting the needs of their primary caregivers. Konijnenberg et al. (2016) and McGlone and Mactier (2015) describe the implications of a NAS diagnosis on maternal-child interaction and this impact on future cognitive development. A parent who is not knowledgeable about classic withdrawal behavioral patterns will be ill-equipped to care for the infant, possibly leading to a fractured relationship. These authors support parent training interventions, often provided during methadone program participation that offer ways to focus on being sensitive to their child's needs and activities to stimulate neurodevelopment.

Faherty et al. (2018) analyzed 15,571 NAS diagnosed infants born to Medicaidinsured women and determined that these women were more likely to suffer from depression, anxiety, bipolar disorder, or schizophrenia. This information demonstrates the significance of building a holistic approach to caring for families affected by NAS.

Maguire et al. (2016) conducted a systematic literature review referencing NAS and long-term outcomes. Identified themes of the 19 research articles included the following:

- varying descriptions of NAS withdrawal symptoms based on the severity of opioid exposure during pregnancy
- the need for standardized nursing clinical protocols
- the need for decreased pharmaceutical intervention
- the importance of effective infant soothing techniques
- recognition of staff apprehension related to varying treatments
- the results of increased staff self-efficacy with adherence to a firm configuration of educational components

# **Gaps in Knowledge**

NAS flounders with progressive efforts due to a general lack of public knowledge about the cost of NICU specialized care, associated costs to families affected by NAS, and appropriate treatment. Corr and Hollenbeak (2017) studied the records of 27,943 NAS infants to determine the financial implications of the wide variance in assessment techniques and treatment protocols. Their research findings indicated that annual federal funding costs quadrupled from 2003 to 2012 in care related to NAS infants. As noted by Monnelly et al. (2019) and Whitham et al. (2015), the existing literature lacks identification of long-term neurodevelopment effects of a NAS diagnosis and long-term effects related to the use of methadone during pregnancy. Faherty et al. (2018) confirmed the need for better opioid-withdrawal assessment techniques to prevent missing subtle withdrawal cues once the infant leaves the clinical setting. Based on this information, a national standardization of care would promote quality patient outcomes and costeffective measures related to reduced NAS infant length of stays.

# **Solution Strategies**

The relationship between opioid dependence and pregnancy is a stigmatized condition that many women struggle to overcome. Transparent communication between the healthcare team and the family of NAS infants can reduce the stigma and criminalization associated with opioid use during pregnancy (Recto et al., 2020). Research findings from the Substance Abuse and Mental Health Services Administration (2019) support professional familiarity with NAS content to promote conversation in informal and direct patient care settings.

Evidence supports MI techniques such as coaching and affirmation, open-ended questions, summarizing reflection, and reflective listening (Madson et al., 2016). Further studies (Chang et al., 2019; Jiang et al., 2017) describe the impact of standardized MI training on nurses who care for substance abuse populations. These studies have shown that use of MI techniques continuously promote effective communication between patients and nurses, increasing knowledge and confidence (Chang et al., 2019; Jiang et al., 2017).

Eat, Sleep, Console is a relatively newer approach to minimize medicinal intervention. This method differs from previous treatment plans in that the nurses score the infant with NAS based on the ability to tolerate feedings, time spent asleep, and consolability. This comfort care method emphasizes the need to keep the infant well-fed and well-rested, making the infant easier to console and has been associated with less (98% down to 14%) pharmacological exposure, and it has been correlated with decreased length of stays (Grisham et al., 2019; Grossman et al., 2018; Wachman et al., 2018).

A crucial component of the Eat, Sleep, Care model is to establish consistency in scoring twenty-one of the most common infant withdrawal symptoms with the Modified Finnegan Neonatal Abstinence Scoring System Score Sheet. (D'Apolito & Finnegan, 2010) (see Appendix B). This tool was developed to assist providers in quantifying the assessment of observed withdrawal symptoms. Using this tool, pharmacologic management is based on the severity of scored withdrawal symptoms; therefore, interrater assessment must be congruent (D'Apolito & Finnegan, 2010; Devlin et al., 2020).

According to the literature review of 25 articles conducted by Clark (2019), breastfeeding should be encouraged for HIV-negative women and those on opioid maintenance therapy. "Apart from the typical benefits of breastfeeding for infants, breastfeeding has been shown to decrease NAS symptoms, the need for pharmacotherapy, and the length of newborns' hospital stay" (Clark, 2019, para. 4). The review also noted that barriers to breastfeeding exist due to staff misinformation, lack of staff knowledge about lactation, an absence of continued support upon discharge, and transportation deficiencies.

Suchman et al. (2017) described the effectiveness of a 12-week mentalizationbased individual therapy program called Mothering from the Inside Out (MIO). This study revealed the strong potential of brief but intensive interventions that address impulsivity, emotional reactivity, and low distress tolerance, and promote increasing the mother's mental capacity. One hundred mothers treated for substance abuse were studied to determine whether the MIO approach would lead to better parent-child interactions when compared to 12 parent education sessions. The research identified that those in the MIO program self-identified a stronger bond with their children and showed promise for improving caregiving quality, compared with the non-participating group.

As noted by Teague et al. (2015), the use of interprofessional collaboration streamlines care and results in a significantly better outcome. The authors used the Perinatal Quality Collaborative of North Carolina framework (2013), a multidisciplinary, hospital-based standardized approach to identifying infants at risk by training the staff on assessment tools to increase inter-rater reliability. Nursery staff members were also trained on implementing non-pharmacologic treatment before using pharmacologic intervention. The study results also suggest that rooming-in and breastfeeding are valuable resources to incorporate into the standardized plan to promote family bonding.

NAS is both an individual family and a shared community problem. It is imperative to move past the discussion phase of a standardized plan and make headway on the implementation phase to begin making progress. There is much agreement that a standardized method is necessary, but there has not been much positive movement on a national approach to the problem. The time has come for standard assessment techniques and treatment protocols to include a holistic treatment plan that encompasses the whole family. This literature review points out that the best results come from interdisciplinary teams that work with a common purpose, make decisions together, and share the success and responsibility of the endeavor.

As communities struggle with addressing fragmented addiction services and gaps in care, important consideration needs to be made to the primary prevention of or minimization of opioid abuse during pregnancy. Since 2014, the American Pain Society and the American Academy of Pain Medicine (Association of State and Territorial Health Officials, recommend that during the preconception period "clinicians should counsel women of childbearing potential about the risks of chronic opioid therapy during pregnancy and implement routine screening for substance use at every healthcare visit" (p. 9).

Another valuable primary prevention intervention when caring for pregnant women with opioid use disorder is smoking cessation counseling. Berlin and Oncken (2018) describe the effects of tobacco use during pregnancy, which, among other negative health outcomes, increases the risk of preterm birth, low birth weight, cleft lip, and placental abnormalities. The likelihood of these adverse outcomes is exacerbated for compromised infants born with NAS.

Implementing an evidence-based nursing intervention NAS toolkit that focuses on NAS care in the acute care setting has shown some promising results in increasing nursing staff self-efficacy and NAS knowledge levels (Association of State and Territorial Health Officials, 2014; Indiana Department of Health, 2018; Indiana Perinatal Quality Improvement Collaborative, 2018). The Perinatal Substance Use Practice Kit is a NAS toolkit for Indiana hospitals that serves as an educational resource and guideline to simplify identification and care interventions to treat families and infants affected by NAS (Association of State and Territorial Health Officials, 2014; Indiana Department of Health, 2018; Indiana Perinatal Quality Improvement Collaborative, 2018).

If NICU providers understand the available evidence-based treatments related to NAS, the families of these infants are more likely to get the treatment options that best

meet their needs and are more likely to have a health care plan that assists with recovery.

# **Review of Theory**

Opioid use during pregnancy is a treatable affliction. Treatment starts with developing the knowledge base and self-efficacy of the bedside nursing staff to promote non-biased, supportive care. The project used the grand theory of self-care deficit by Dorothea Orem (2001), the middle-range theory of interpersonal relations by Hildegard Peplau (Hagerty et al., 2017), and the Iowa Evidence-Based Practice Model (Iowa Model Collaborative, 2017) to guide this change in practice. Orem's theory (2001) proposes that "people have a natural capacity for self-care, and nursing care is directed at identifying these deficit areas" (p. 42). According to Fawcett (2005), Peplau's theory of interpersonal relations examines the significance of the nurse-patient relationship and its impact on patient outcomes. The Iowa framework guides integrating and sustaining practice change (Iowa Model Collaborative, 2017).

# **Theory of Self-Care Deficit**

Orem's grand nursing theory of self-care deficit consists of three components: the theory of self-care, the theory of self-care deficit, and the theory of nursing systems (Orem, 2001). Self-care is defined as the "performance or practice of activities that individuals initiate and perform on their behalf to maintain life, health, and well-being" (Orem, 2001, p. 43). The self-care deficit theory indicates the ability to engage in self-care behaviors. The nursing system theory proposes that nurses have the knowledge, ability, and power to act deliberately to assist individuals in meeting their self-care requisites (Orem, 2001). This grand theory demonstrates how to begin formalizing knowledge about what persons need to do to maintain health and well-being (Alligood,

2018). Orem also proposes that human beings should be active participants in their selfcare and maintain or increase their health status (Younas, 2017). This theory served to structure the project by creating a stigma-free clinical environment to promote familial bonding between the NAS infant and family.

Orem's theory (2001) guided this DNP project by outlining the need for nursing care; in this case, self-care may be maintained through a distinct knowledge base and evidence-based techniques. The nurse's role in this DNP project is to increase the level of knowledge and self-efficacy related to NAS, utilize evidence-based protocols for infant comfort measures, assess the patient's needs, develop an individualized plan, implement this plan, and then evaluate the effectiveness of the strategy.

The self-care deficit theory (Orem, 2001) supports the implementation of a NAS toolkit for the NICU staff and empowered the staff members to recognize behaviors related to addiction and prioritize the promotion of self-care behavior in mothers addicted to opioids. Implementation of this NAS toolkit enhanced the motivation for a deliberate change in the personal development of nursing behavior related to the stigma of substance abuse. Transitioning from a culpable patient perspective to a transparent relationship that supports evidence-based nursing interventions focused on effective self-care treatment can encourage communication without fear of repercussions.

#### **Theory of Interpersonal Relations**

The nursing theory of interpersonal relations by Hildegard Peplau (Hagerty et al., 2017; Peplau, 1997) emphasized patients' experiences and nurse-patient relationships' effects on those experiences. Peplau's theory (1997) focuses on four phases of an interpersonal relationship: orientation, identification, exploitation, and resolution. The

common goals are patient satisfaction and ensuring that the patient actively participates in developing their plan of care. The nurse brings to a professional relationship the knowledge, skills, and attitude needed to help the patient find a means to resolve or manage their illness (Deane & Fain, 2015). Purposeful nursing intervention through the therapeutic nurse-patient relationship fosters trust, mutual goal-setting, and improved learning experiences. With guidance from this theory, clinicians strive to understand the disease process and cultivate a therapeutic relationship to enhance patients' experience and engage them in their care (Kelley et al., 2014).

For this DNP project, Peplau's theory (1997) was utilized to communicate the significance of the nurse-patient relationship. Efficient communication is integral to the nurse-patient relationship and necessary for educational efforts to be successful. The nurse participants assigned to the program established learning goals, review these goals, and evaluated the teaching methods' effectiveness with a pre and post-test survey (see Appendix A). This project utilized Peplau's communication principles as the main instrument to facilitate changes in patient behaviors (Deane & Fain, 2015). "Using this therapeutic form of communication, nurses provide reflective and nonjudgmental feedback to patients to clarify their thoughts" (Hagerty et al., 2017, p. 164). This DNP project concentrated on developing a NAS toolkit to enhance communication between the staff and the families of NAS infants.

#### The Iowa Model of Evidence-based Practice

Implementing evidence-based practice (EBP) change is difficult; therefore, nursing leaders must use effective implementation strategies to engage clinicians and promote the adoption of evidence-based care delivery to improve patient outcomes. The Iowa Model (Iowa Model Collaborative, 2017) was an ideal choice for the structure of this project. The Iowa practice model was chosen for its ease of use in implementing practice change in a clinical setting. Permission was received to use the model for this project (Appendix C).

This systematic evidence-based practice approach focuses on organization and collaboration, allowing nurses to target knowledge gaps and problem-focused triggers (White & Spruce, 2015). Problem-focused triggers include recurrent clinical problems related to quality of care as identified by primary bedside staff (White & Spruce, 2015). This project aimed to provide different educational formats to multiple audiences in a holistic platform to impact current NAS outcomes.

The Iowa model offers a step-by-step algorithm to integrate research into practice (White & Spruce, 2015). Using this model to guide the implementation strategy adds clarity and structure to the process. Iowa model strategies are selected and positioned to enhance the movement through four implementation phases: creating awareness and interest, building knowledge and commitment, promoting action and adoption, and pursuing integration and sustainability to encourage application by nursing and team leaders (Cullen et al., 2018).

# **Create Awareness and Interest**

The discovery of gaps in nursing knowledge and an increase in admissions

associated with NAS admissions began a process of changing practice. Optimal healthcare goals set by federal and local NAS-related standards of care discourage variation in assessment and treatment plans. Barriers that have been identified to contributed to low self-efficacy for nurses and more extended NICU admission stays include a lack of foundational NAS knowledge and variability in nursing care interventions (Cook et al., 2017).

For this project, once the opportunity for improvement was identified, a body of evidence was assembled, appraised, and synthesized. An implementation process was developed including constructing an evidence-based nursing intervention NAS toolkit for use at the bedside by registered nurses in the NICU. After Institutional Review Board (IRB) approval was received, the project manager prepared the participants with a preliminary meeting to discuss the change process.

#### **Build Knowledge and Commitment**

Super-users were trained to be authorities on NAS content used in the NAS toolkit. Each super-user was promoted as a change agent for quality care during unit meetings. Training sessions were held to decrease variation in nursing practice at the bedside and increase knowledge about NAS.

#### **Promote Action and Adoption**

The project manager attended the training sessions conducted by the superusers to ensure consistency in the delivery of content to the remaining registered nurses. The registered nurses in the NICU demonstrated comprehension in the new documentation and patient teaching process. Reminders and prompts were placed in the registered nurses' work areas for documenting.

# **Pursue Integration and Sustained Use**

The project manager worked with a representative from the information technology (IT) department to create a mandatory check-off in the infant medical record. The project manager also worked with the NICU clinical educator on adding the educational NAS toolkit content to the annual competency exam for the NICU registered nurses.

# **Alignment of Theory**

Both nursing theories chosen for this DNP project are widely used to target desired health behavior change. Each provides a framework to support the holistic educational method utilized in this DNP project and includes a structure for evaluating the effectiveness of the teaching.

The project manager noted a similar situation for self-care deficits in patients with addictions and uncontrollable impulses, where caregivers could not care for these families without prejudice. It is difficult to visualize patient autonomy if the approach to care is biased. Promoting self-care from a nursing perspective includes personal and professional growth to support a culture of safety and justice. As such, reflective practices and accountable care like those used in MI were identified as key in promoting a destigmatized culture.

Nurturing an environment that provides knowledge and health literacy about substance abuse would also shift the interpersonal relationship between the caregiver and the patient. An opportunity for a therapeutic relationship becomes possible when the ability to understand one's own behavior and the identification of preconceived ideas about addictive behaviors are recognized. To facilitate change in clinical practice, the Iowa Evidence-Based Practice Model (Iowa Model Collaborative, 2017) provided a foundation to guide the decision-making process. This model emphasizes the importance of feedback loops throughout the model, reflecting stakeholder interest, and encouraging support for building organizational commitment (Iowa Model Collaboration et al., 2017). For this DNP project, the project manager worked with the super-users to incorporate their ideas into toolkit content and reinforced behavior change by identifying their perspectives and incorporating their input into the training sessions. This process recognized the importance of working in collaboration with the key stakeholders to sustain the use of the project.

#### **Chapter III: Method**

The quality improvement project implemented an evidence-based noninvasive nursing intervention NAS toolkit, aligned neonatal abstinence withdrawal scoring, and introduced a checklist to document family education about NAS in the infant medical record. The implementation process was initiated following IRB proposal approval. Research has identified a self-described deficit of knowledge and skills by NICU staff members regarding NAS protocols (Ordean et al., 2017). Nurses caring for infants with NAS needed education on current evidence-based practice to improve the quality of care.

This project consisted of a team of four registered nurses (super-users) trained by the project manager to implement a new evidence-based care method customized for NAS families. The super-users introduced the remaining NICU staff to the proper use and documentation of noninvasive nursing interventions. The project manager administered a voluntary pre and post survey called *The Assessment of Nursing Knowledge and Self-Efficacy Related to NAS* (ANKS) (see Appendix A) of the staff to discover any improved levels of nursing knowledge and self-efficacy related to NAS.

The quality improvement project introduced an evidence-based noninvasive nursing intervention NAS toolkit to the four identified registered nurses (super-users) who educated the remaining NICU nursing staff. This training will also be included in the annual NICU staff required competencies in the future. The newly trained staff nurses provided relevant educational training to patients' families and encouraged their interaction and implementation of the strategies provided in the education NAS toolkit.

The project utilized the Modified Finnegan Neonatal Abstinence Scoring System Score Sheet (see Appendix B). This tool was developed to standardize the assessment of infants in opioid withdrawal based on different criteria regarding central nervous system, metabolic, vasomotor, respiratory, and GI disturbances. Infants that warrant a score of less than eight are considered to be suffering from opioid withdrawal and would require further intervention from the healthcare team (Capino, 2019). Consistency in scoring methods was reviewed and potential areas for increased scoring was identified and discussed among the NICU nurses.

The EMR was revised to allow for the documentation of the NAS toolkit education. Patient records of infants whose families received NAS toolkit education were analyzed to discover whether overall admission time in the NICU was reduced after the family received education on effectively interacting with their infant as detailed in the NAS toolkit. The project manager supervised the training of the remaining staff and provided timely feedback and coaching tips regarding staff teaching techniques during the training sessions.

#### **Design of the Project**

The clinical implementation process of the NAS toolkit introduction was as follows.

# Step 1

For this DNP project, two field experts reviewed a self-efficacy measurement tool that was structured using Bandura's self-efficacy model (1997) called *The Assessment of Nursing Knowledge and Self-Efficacy Related to NAS* (ANKS) (see Appendix A) for validity and reliability before being administered to the NICU nurses.

The ten-question survey was created to assess knowledge and self-efficacy related to NAS content. The survey reliability reflects the extent to which items in the same survey measure the same dimension. Results indicated that the ANKS survey displayed high internal consistency ranging from r=.80 to r=.95. Furthermore, based on expert review of content, the ANKS demonstrated to be a reasonably reliable and valid instrument for assessing nursing knowledge and self-efficacy related to neonatal abstinence syndrome content.

After the survey was created, the project manager trained four identified staff members as super-users or content experts to use the noninvasive nursing intervention tool kit. The four-hour session included information about NAS and recognition of infant withdrawal signs, the eat, sleep, console model of care, benefits of infant rooming-in with family, MI techniques, providing breastfeeding support, and instruction about the effects of tobacco use during pregnancy. Booklets and worksheets were provided for distribution and copying for future use. The materials that were included with the NAS toolkit adhered to the standard of care outlined in the Perinatal Substance Use Practice Bundle- A Toolkit for Indiana Hospitals (Indiana Perinatal Quality Improvement Collaborative, 2018). Standardized PowerPoint materials were provided for the superusers to use as well as worksheets for easy reference.

# Step 2

All NICU registered nurses were asked to complete a pre-survey ANKS administered by the project manager to determine self-efficacy and baseline knowledge level. The project manager met with the IT representative of the facility and developed a checkoff to be included in the infant EMR to document education about NAS.

The EMR was updated with an alert to remind nurses to document patient teaching, involving non-pharmacological interventions to soothe the infant, the effects of tobacco during pregnancy, and around a newborn. The checklist also included a subjective assessment of how receptive to the information the family was during the teaching session. This information was accessible by other members of the healthcare team and allowed for interdisciplinary follow-up of information with the families.

# Step 3

The NICU staff implemented the NAS toolkit under the direct supervision of the super-users and the project manager until a proficient level of competence was achieved. The project manager was available on the unit to oversee the training sessions and provide appropriate, timely feedback to the staff. Documentation of the team's educational sessions with NAS families was completed directly in the infant EMR.

# Step 4

Thirty-six NICU registered nurses completed a post-survey ANKS to determine self-efficacy and knowledge level changes. Two staff members did not complete the post-survey one due to prolonged illness and the other due to maternity leave. The ANKS was administered to the NICU team by the project manager. All participants had the option to decline the self-efficacy and level of knowledge questionnaire.

#### Step 5

The changes in the length of stay were analyzed and evaluated by the project manager using patient record data. There was no confidential or identifying information transcribed from the patient chart. Only the date of admission to the NICU and discharge from the NICU were collected.

# Setting

This project was completed in a maternal-child department at a nonprofit,

Midwest hospital. The maternal-child department where the project was implemented has 21 adult beds dedicated to mother-baby admissions with capabilities to house 25 NICU admissions, 15 intermediate care admissions, and 35 well-born infants. The nursery is a certified Level III NICU. The Indiana Perinatal Level of Care Program defines Level III as "hospitals equipped to care for complex maternal medical conditions and obstetric complications as well as infants requiring neonatal intensive care" (Indiana Department of Health, 2019, p. 9).

# **Population**

The participants included four super-user registered nurses and thirty-eight staff registered nurses (n=38). (The super-users were tasked with completing the extended version of the training session and were not included in the data). The extended version discussed various teaching techniques and classroom strategies. The 38 staff nurses were required to attend the training sessions and complete mandatory charting on infant medical records. All thirty-eight NICU registered nurses were included in the training sessions.

The population sample of participants were between 22-70 years of age. The years of experience for the 38 staff nurses were between 6 months and 35 years. There were thirty-four females and four male participants. Recruitment strategies included an informational flyer placed on the unit before training sessions and discussion of project and project goals at staff meetings during the months before implementation.

#### **Data Collection**

The process measures in place for this project included:

1. The ANKS self-efficacy measurement tool (see Appendix A) was structured using

Bandura's self-efficacy model (1997). The ANKS is a pre and post-test assessment of staff efficacy and identification of knowledge about evidence-based noninvasive ~ interventions for NAS infants. It includes eight questions with a 7-point Likert scale and three open-ended questions. The pre and post-test data related to the first 8 questions was analyzed using a repeated-measure ANOVA, SAS PROC MIXED model.

- Thirty days after implementing the educational NAS toolkit the staff were surveyed regarding potential process improvements. The three open-ended questions (Appendix A) focused on the efficacy of the materials and teaching techniques related to program content.
- 3. The NAS toolkit was introduced to the super-users by the project manager during four-hour training sessions. The training sessions were completed on the maternal-child unit in a designated conference room. The training with the super-user group occurred face-to-face during an assigned meeting time at the convenience of their schedules. Participants engaged in a didactic presentation of materials. Following the session, the super-users disseminated the noninvasive nursing interventions and EMR documentation to the remaining NICU team members under the supervision of the project manager. The super-users disbursed the information during weekly sessions until all thirty-eight NICU staff completed the training. The project manager attended the sessions to provide staff the opportunity to ask questions. The project manager administrated the ANKS survey pre/post-training to the NICU registered nurses.
- 4. The NICU staff taught the NAS families about noninvasive nursing interventions.

The project manager intermittently supervised these interactions during discharge planning in the clinical setting. The families were provided with a booklet of the topics covered for later reference. The NICU staff documented the completion of patient education in the infant EMR.

- 5. Other descriptive statistics collected:
  - a. The number of NAS infant admissions and the length of stay for NAS infants that received the noninvasive nursing interventions specified in the NAS toolkit were compared to length of stay for NAS infants from previous years, 2018 and 2019.
  - b. Demographics collected from NICU nurses included: gender and years of experience as a registered nurse and years of experience in NICU setting.

# **Ethical Implications**

IRB approval from Indiana Wesleyan University was obtained prior to DNP project initiation (see Appendix C). All registered nurses signed a consent form for participation (see Appendix D). NICU registered nurses did not object to sharing their unidentified individual survey results with department leadership, including the executive team, department director, manager, perinatal navigator, and the NICU clinical educator. To respect any non-verbalized objections and ensure anonymity, the project manager and the department manager were the only ones with access to identifying paperwork for the surveys. Once the data was collected, it was kept in a locked cabinet located in the manager's office until data evaluation and analysis was completed. The project manager maintained the confidentiality of the results. All signed survey sheets will be retained for a minimum of three years after the close of the project by the project manager. There were minimal risks to participants.

#### **Chapter IV: Results**

Thirty-eight NICU registered nurses completed the NAS toolkit training. A pre and post-survey was administered to assess changes in self-efficacy and knowledge level related to NAS. The pretest revealed limited knowledge about effective nursing interventions for NAS. The registered nurses self-reported increased self-efficacy and demonstrated increased correct responses to knowledge level questions post toolkit training.

The self-efficacy mean score from the post-survey was higher post-training (Mean=6.61, SD=0.32) compared to pre-training (Mean=5.77, SD=0.42). Based on this modified paired t-test, with a *p*-value of less than .0001, there is strong evidence to suggest there is a significant difference between the pre and post-test scores. The nurses scored .85 points higher than the pre-test after NAS toolkit training. The three open-ended questions had more correct responses post toolkit training. The post-test did not have any incomplete responses.

The number of infants diagnosed with NAS in 2018 was 48. The length of stay was 14-119 days (Mean=66.5). The number of infants diagnosed with NAS in 2019 was 62. The length of stay was 10-78 days (Mean=44). The number of infants diagnosed with NAS thirty days post-toolkit implementation was 2. The length of stay at the time of project completion was unable to be determined, one infant was discharged after 15 days, and the other remained in the NICU at project completion. The department NICU clinical educator will continue to evaluate NAS infant length of stay post-training and report results to project manager for the remainder of 2022.

#### **Results of Data Collection/Analysis**

Self-efficacy and knowledge level were analyzed pre and post-test. Both selfefficacy and knowledge level improved following implementation of the project.

# Self-Efficacy & Knowledge Level -Inferential Statistics

The analysis would ordinarily be carried out via a paired *t*-test; however, two of the respondents failed to answer all the Likert questions on the pre-test. Hence, a mean could not be calculated for them (since it would not represent all the questions). The paired t-test needs a data point for the pretest, and the post-test or those responses were omitted from the analysis. A repeated-measure ANOVA, SAS PROC MIXED does not require a data point for each version of the test, so analyzing the data this way allows the inclusion of the post-test values for those two respondents. The repeated measure was the time point (pretest or post-test). The repeated measure accounts for the potentially correlated observation between the two time points since the same subject takes the test both times.

Descriptive statistics for mean scores by time point are given in Table 1 Descriptive Statistics for Self-Efficacy by Time Point: Questions 1-7 from ANKS survey (Tables). This table demonstrates that the nurses' self-efficacy improved by .85 points post-toolkit training. The self-efficacy mean score from the post-survey was higher posttraining (Mean = 6.61, SD=0.32) compared to pre-training (Mean = 5.77, SD=0.42)

Model assumptions were checked via residual plots and deemed to be met. Based on a p-value of less than 0.0001, strong evidence suggests a significant mean difference between the pretest and post-test self-efficacy scores. The estimated difference in the data is 0.85 points higher on the post-test. A 95% confidence interval

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for the true mean difference among all such NICU nurses is (0.76, 0.94).

#### **Open-Ended Questions-Descriptive Statistics**

Summation results for questions 8, 9, and 10 by time point are given in Tables 2-4. Table 2 Open-ended Question 8 to Determine Knowledge Level about NAS Pre and Post Toolkit Training from ANKS Survey. This table demonstrates that the nurses had less incorrect responses post-toolkit training. The number of correct responses pretraining was 31 (86%); post-training correct responses were 36 (100%). Correct responses increased by 14%.

Table 3 Open-ended Question 9 to Determine Knowledge Level about NAS Pre and Post Toolkit Training from ANKS Survey. This table demonstrates that the nurses had less incorrect responses post-toolkit training. The number of correct responses pre-training was 30 (78.95%); post-training correct responses were 37 (100%). Correct responses increased by 18%.

Table 4: Open-ended Question 10 to Determine Knowledge Level about NAS Pre and Post Toolkit Training from ANKS Survey. This table demonstrates that the nurses had less incorrect responses post-toolkit training. The number of correct responses pretraining was 23 (61%); post-training correct responses were 38 (100%). Correct responses increased by 39%.

The *Frequency* column shows the number of times a response was given, and the *Percent* column shows the percent of all observations that the answer represents. For example, the first row in Table 2 tells us that five subjects correctly responded with *Feed*, which accounts for 13.16% of all responses. Tables 3 and 4 also include columns for *Cumulative Frequency* and *Cumulative Percent*, which are running totals for those

variables. From a purely descriptive standpoint, there are more correct answers on the post-test than the pretests. There were also no skipped questions on the post-test, while there were skipped questions for all three questions on the pre-test.

#### Discussion

The modified *t*-test results showed that standardized training of NAS interventions significantly improved self-efficacy. The number of correct responses revealed increased knowledge post-toolkit training. The data suggests that a standardized training method for NICU nurses about NAS increases self-efficacy and knowledge level. The results of introducing the NAS toolkit indicate that the nurses could identify non-pharmacological nursing interventions as a significant part of the care plan. The NAS toolkit training effectively educated the nurses on the importance of standardized scoring for infant withdrawal symptoms.

Many of the nurses verbalized and increase in confidence. One nurse reported, "feeling much more confident in [Finnegan] scoring" and another relayed, "I appreciate that we are all on the same page with scoring now." Healthcare providers must be trained to understand the significance of responding appropriately to infants in withdrawal distress. With accurate and consistent assessments using the Finnegan scoring sheet (D'Apolito & Finnegan, 2010) (see Appendix B), NICU nurses are better prepared to address the immediate needs of NAS infants.

#### **Implications for Practice**

This data builds on existing evidence supporting unification for NAS training protocols. Strategies to implement screening and non-pharmacological interventions are crucial to early intervention for the compromised infant. The training protocol

developed for this project trained new NICU nurses and provided a performance benchmark for current nurses. By establishing standardized assessments, nursing intervention guidelines, improved training of providers, neonatal withdrawal can be more accurately monitored and consistently managed. Subsequent training may enhance further non-pharmacological nursing interventions in daily practice. Future research may determine if nursing stigma related to substance abuse decreases with NAS toolkit training. Further training about substance abuse could include self-awareness and reflection of practice as essentials for unbiased care.

#### Limitations

There are several limitations to the data collected from this project. The time from implementing the training NAS toolkit to post-survey was unavoidably shortened due to COVID-19 restrictions at the site. The project manager could not measure the long-term length of stays for infants admitted with a NAS diagnosis post-toolkit implementation. The number of infants admitted with NAS during November and December for 2021 was relatively low compared to previous years. The first NICU nurse survey results were not completed in their entirety, resulting in the need to use a modified *t*-test.

#### Recommendations

NAS statistics continue to rise, and NICU nurses need to be competent in quality care interventions that are evidence-based. Uniform training about evidence-based nonpharmaceutical nursing interventions and standardized NAS infant withdrawal scoring for NICU nurses are essential to providing optimal care for these patients. NAS toolkit information can be reviewed annually and completed with newly hired NICU nurses during orientation.

### Conclusion

In summary, NAS statistics have markedly increased in the U.S. since 2015, impacting families, communities, and healthcare systems. The severity of the newborn condition often warrants extended treatment and longer stays in an intensive care environment resulting in inflated costs and intricate treatment plans. This increase has led to the need for standardized education of first-line providers on evidence-based evaluation and treatment options for infant withdrawal. Efforts aimed at educating nursing staff about the uniform process show positive perceptions. Evidence supports standardization of scoring and nursing education to improve nursing self-efficacy and knowledge. Given the complexity of care of a NAS infant, specialized training for NICU nurses optimizes the chance for better neonatal outcomes. This project aimed to demonstrate that self-efficacy and level of knowledge can be maximized by training providers on evidence-based non-pharmaceutical nursing interventions, thus promoting the confidence of NICU nurses with NAS infant care protocols.

#### **Conflict of Interest**

The author has no conflicts of interest to disclose.

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## Appendices

## Appendix A

## Assessment of Nursing Knowledge and Self-Efficacy related to NAS (ANKS)

For survey items 1– 8 select the number that <u>most accurately reflects your belief in your</u> <u>ability to do each task</u>. THERE ARE NO RIGHT OR WRONG ANSWERS. Please answer truthfully and completely as possible for each item.

There are seven possible choices for each item:

1 = Never

- 2= Almost Never
- 3= Seldom
- 4= Sometimes
- 5= Usually
- 6= Almost Always
- 7= Always
  - 1. I implement evidence-based knowledge about motivational interviewing techniques to provide adequate care for families of NAS affected infants. (Knowledge)

1= Never 2= Almost Never 3= Seldom 4= Sometimes 5= Usually

- 2. I appropriately provide evidence-based instruction about the effects of tobacco use during pregnancy (Knowledge)
  1= Never 2= Almost Never 3= Seldom 4= Sometimes 5= Usually
  6= Almost Always 7= Always
- 3. I appropriately provide evidence-based non-pharmaceutical soothing techniques for the NAS infant. (Knowledge)

1= Never 2= Almost Never 3= Seldom 4= Sometimes 5= Usually

6= Almost Always 7= Always

4. I believe I influence the decision-making made by NAS families. (Bandura s/e -Efficacy to Enlist Parental Involvement)
1= Never 2= Almost Never 3= Seldom 4= Sometimes 5= Usually
6= Almost Always 7= Always

## 5. I believe that I get parents involved in the care of their NAS

infant. (Bandura s/e -Efficacy to Enlist Parental Involvement)

1= Never 2= Almost Never 3= Seldom 4= Sometimes 5= Usually

6= Almost Always 7= Always

- 6. I believe the use of evidence-based information when teaching about breastfeeding promotes family compliance. (Bandura s/e Efficacy to Enlist Parental Involvement)
  1= Never 2= Almost Never 3= Seldom 4= Sometimes 5= Usually
  6= Almost Always 7= Always
- 7. I believe that I stand firm to someone who is asking me to do something that is not an evidence-based nursing intervention when caring for NAS infants. (Bandura s/e -Self-Assertive efficacy)
  1= Never 2= Almost Never 3= Seldom 4= Sometimes 5= Usually
  6= Almost Always 7= Always
- 8. Name one evidence-based *nursing* intervention routinely used in caring for infants with NAS and their families. (Knowledge)

9. Name 3 non-pharmaceutical evidence-based nursing interventions to use when caring for NAS infants. (Knowledge) 10. Name 2 techniques for motivational interviewing to use when caring for their families of NAS infants. (Knowledge)

# Appendix B

# Modified Finnegan Neonatal Abstinence Scoring System Score Sheet

NEONATAL ABSTINENCE SCORING SYSTEM										
	Modified Finnegar	n Neona	tal Ab	stine	ence	Sco	re S	She	et <sup>1</sup>	
System	Signs and Symptoms	Score		AM		РМ			Comments	
	Excessive high-pitched (or other) cry < 5 mins	2								
sec	Continuous high-pitched (or other) cry > 5 mins	3								
and	Sleeps < 1 hour after feeding	3								
dru	Sleeps < 2 hours after feeding	2								
Dist	Sleeps < 3 hours after feeding	1								
m	Hyperactive Moro reflex	2								
ste	Markedly hyperactive Moro reflex	3								
ŝ	Mild tremors when disturbed	1								
sno	Moderate-severe tremors when disturbed	2								
erv	Mild tremors when undisturbed	3								
N	Moderate-severe tremors when undisturbed	4								
ntra	Increased muscle tone	1								
Ce	Excoriation (chin, knees, elbow, toes, nose)	1								
	Myoclonic jerks (twitching/jerking of limbs)	3								
	Generalised convulsions	5								
	Sweating	1								
s	Hyperthermia 37.2-38.3C	1								
tor/	Hyperthermia > 38.4C	2								
somo	Frequent yawning (> 3-4 times/ scoring interval)	1								
Dis Ca	Mottling	1								
ory	Nasal stuffiness	1								
abc	Sneezing (> 3-4 times/scoring interval)	1								
Met	Nasal flaring	2								
L 98	Respiratory rate > 60/min	1								
	Respiratory rate > 60/min with retractions	2								
ointestinal Disturbances	Excessive sucking	1								
	Poor feeding (infrequent/uncoordinated suck)	2								
	Regurgitation (≥ 2 times during/post feeding)	2								
	Projectile vomiting	3								
	Loose stools (curds/seedy appearance)	2								
	Watery stools (water ring on nappy around stool)	3								
	Total Score									
	Date/Time									
Gast	Initials of Scorer									

1. Finnegan LP. Neonatal abstinence syndrome: assessment and pharmacotherapy. In: Nelson N, editor. Current therapy in neonatal-perinatal medicine. 2 ed. Ontario: BC Decker; 1990.

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#### **NEONATAL ABSTINENCE SCORING SYSTEM**



The NAS score sheet lists 21 symptoms that are most frequently observed in opiate-exposed infants. Each symptom and its associated degree of severity are assigned a score and the total abstinence score is determined by totalling the score assigned to each symptom over the scoring period.

#### Key points

- The first abstinence score should be recorded approximately two hours after birth or admission to the nursery (baseline score). This score reflects all infant behaviour up to the first scoring interval time point.
- Following the baseline score all infants should be scored at 4-hourly intervals, except when high scores indicate more frequent scoring.
- The score sheet allows for 2-hourly scoring over the 24-hour period.
- A new sheet should be started at the beginning of each day.
- Scoring is dynamic. All signs and symptoms observed during the scoring interval are included in the point-total for that period.
- If the infant's score at any scoring interval is ≥ 8, scoring is increased to 2-hourly and continued for 24 hours from the last total score of 8 or higher.
- If the 2-hourly score is ≤ 7 for 24 hours then 4-hourly scoring intervals may be resumed.
- If pharmacotherapy is not needed the infant is scored for the first 4 days of life at 4-hourly intervals.
- If pharmacotherapy is required the infant is scored at 2- or 4-hourly intervals, depending on whether the abstinence score is less than or greater than 8 throughout the duration of therapeutic period.
- If after cessation of pharmacotherapy the score is less than 8 for the following 3 days, then scoring may be discontinued.
- If after cessation of pharmacotherapy the score is consistently 8 or more, then scoring should be continued for the following 4 days (minimum) to ensure that the infant is not likely to develop late onset of withdrawal symptoms at home following discharge.

#### Guide to assessment and scoring<sup>2, 3</sup>

The neonatal abstinence syndrome scoring system was designed for term babies on four-hourly feeds and may therefore need modification for preterm infants. In a term infant scoring should be performed 30 minutes to one hour after a feed, before the baby falls asleep.

If necessary the infant should be awakened to elicit reflexes and behaviour, but if the infant is woken to be scored then diminished sleep after scoring should not be recorded. A crying infant should be soothed and quietened before assessing muscle tone, Moro reflex and respiratory rate.

High-pitched cry	Score 2 if high-pitched at its peak, 3 if high-pitched throughout. Infant is scored if crying is prolonged, even if it is not high-pitched. <sup>2</sup>					
Sleep	This is a scale of increasing severity and a term infant should receive only one score from the three levels of severity. A premature infant on 3 hourly feeds can sleep for $2\frac{1}{2}$ hours at most. Scoring should thus be 1 if the baby sleeps less than 2 hours, 2 if less than 1 hour and 3 if the baby does not sleep between feeds. <sup>2</sup>					
Moro reflex	The Moro or startle reflex is a normal reflex of young infants and occurs when a sudden loud noise causes the child to stretch out the arms and flex the legs. Score if the infant exhibits pronounced jitteriness (rhythmic tremors that are symmetrical and involuntary) of the hands during or at the end of a Moro reflex. Score 3 if jitteriness and clonus (repetitive involuntary jerks) of the hands and/or arms are present during or after the initiation of the reflex.					

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#### NEONATAL ABSTINENCE SCORING SYSTEM



Tremors	This is a scale of increasing severity and an infant should only receive one score from the four levels of severity. Undisturbed refers to the baby being asleep or at rest in the cot. <sup>2</sup>					
Increased muscle tone	Score if excessive or above-normal muscle tone or tension is observed - muscles become "stiff" or rigid and the infant shows marked resistance to passive movements, e.g. if the infant does not experience any head lag when being pulled to the sitting position; or if there is tight flexion of the infant's arms and legs (unable to slightly extend these when an attempt is made to extend and release the supine infant's arms and legs). <sup>4</sup>					
Excoriation	Excoriations (skin abrasions resulting from constant rubbing against a surface that is covered with fabric such as bed linen). Score only when excoriations first appear, increase or appear in a new area. <sup>2</sup>					
Myoclonic jerks	Score if involuntary muscular contractions which are irregular and exceedingly abrupt (usually involving a single group of muscles) are observed. <sup>4</sup>					
Generalised convulsions	In the newborn infant generalised seizures or convulsions are often referred to as tonic seizures. They are most commonly seen as generalised activity involving tonic extensions of all limbs, but are sometimes limited to one or both limbs on one side. Unusual limb movements may accompany a seizure. In the upper limbs these often resemble "swimming" or "rowing". In the lower limbs, they resemble "pedalling" or "bicycling." Other subtle signs may include eye staring, rapid involuntary movements of the eyes, chewing, back arching, and fist clenching. <sup>4</sup>					
Sweating	Score if sweating is spontaneous and is not due to excessive clothing or high room temperature <sup>4</sup>					
Hyperthermia	Temperature should be taken per axilla. Mild pyrexia (37.2-38.3°C) is an early indication of heat produced by increased muscle tone and tremors.					
Yawning	Score if more than 3 yawns observed within the scoring interval. <sup>2, 4</sup>					
Mottling	Score if mottling (marbled appearance of pink and pale or white areas) is present on the infant's chest, trunk, arms, or legs. <sup>4</sup>					
Nasal stuffiness	Score if the infant sounds congested; mucous may be visible. <sup>4</sup>					
Sneezing	Score if more than 3 sneezes observed within the scoring interval. <sup>2, 4</sup>					
Nasal flaring	Score only if repeated dilation of the nostrils is observed without other evidence of lung or airways disease. <sup>4</sup>					
Respiratory rate	Respirations are counted for one full minute. Score only if >60 per minute without other evidence of lung or airways disease. <sup>2</sup> Score 2 if respiration involves drawing in of the intercostal muscles (retractions).					
Excessive sucking	Score if hyperactive/disorganised sucking, increased rooting reflex, or attempts to suck fists or thumbs (more than that of an average hungry infant) are observed. <sup>3,4</sup>					
Poor feeding	Score if the infant demonstrates excessive sucking prior to feeding, yet sucks infrequently during a feeding taking a small amount of breast milk or formula, and / or demonstrates an uncoordinated sucking reflex (difficulty sucking and swallowing). <sup>3</sup> Premature infants may require tube feeding and should not be scored for poor feeding if tube feeding is expected at their gestation. <sup>2</sup>					
Regurgitation	Score if at least one episode of regurgitation is observed even if vomit is contained in the mouth. $^{\rm 4}$					
Loose/watery stools	Score if loose (curds/seedy appearance) or watery stools (water ring on nappy around stool) are observed. Check the nappy after the examination is completed if not apparent during the examination. <sup>4</sup>					

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**NEONATAL ABSTINENCE SCORING SYSTEM** 



#### References

- 1. Finnegan LP. Neonatal abstinence syndrome: assessment and pharmacotherapy. In: Nelson N, editor. Current therapy in neonatal-perinatal medicine. 2 ed. Ontario: BC Decker; 1990.
- 2. Royal Women's Hospital Drug Information Centre. Newborn Emergency Transport Service (Victoria). Neonatal handbook. Carlton, Vic: Royal Women's Hospital; 2004.
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- 4. Lester BM, Tronick EZ, Brazelton TB. The Neonatal Intensive Care Unit Network Neurobehavioral Scale Procedures. Pediatrics. 2004;113(3 Pt 2):641-67.

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#### Appendix C

#### Critical Appraisal Skills Programme, Systematic Review Checklist



CASP Checklist: 10 questions to help you make sense of a Systematic Review

How to use this appraisal tool: Three broad issues need to be considered when appraising a systematic review study:

- Are the results of the study valid? (Section A)
- What are the results? (Section B)
- Will the results help locally? (Section C)

The 10 questions on the following pages are designed to help you think about these issues systematically. The first two questions are screening questions and can be answered quickly. If the answer to both is "yes", it is worth proceeding with the remaining questions. There is some degree of overlap between the questions, you are asked to record a "yes", "no" or "can't tell" to most of the questions. A number of italicised prompts are given after each question. These are designed to remind you why the question is important. Record your reasons for your answers in the spaces provided.

**About:** These checklists were designed to be used as educational pedagogic tools, as part of a workshop setting, therefore we do not suggest a scoring system. The core CASP checklists (randomised controlled trial & systematic review) were based on JAMA 'Users' guides to the medical literature 1994 (adapted from Guyatt GH, Sackett DL, and Cook DJ), and piloted with health care practitioners.

For each new checklist, a group of experts were assembled to develop and pilot the checklist and the workshop format with which it would be used. Over the years overall adjustments have been made to the format, but a recent survey of checklist users reiterated that the basic format continues to be useful and appropriate.

**Referencing:** we recommend using the Harvard style citation, i.e.: *Critical Appraisal Skills Programme (2018). CASP (insert name of checklist i.e. Systematic Review) Checklist. [online] Available at: URL. Accessed: Date Accessed.* 

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Critical Appraisal Skills Programme (CASP) part of OAP Ltd www.casp-uk.net

### Appendix D

### Permission to use the Iowa Model Revised

Mail - Maria V Hughes - Outlook

Permission to Use The Iowa Model Revised: Evidence-Based Practice to Promo	ote
Excellence in Health Care	

Kimberly Jordan - University of Iowa Hospitals and Clinics <noreply@qemailserver.com> Thu 8/6/2020 2:42 PM

To: Maria V Hughes <brewer74@pnw.edu>

4/19/22, 11:31 AM

**CAUTION:** This email originated from outside of the PNW environment. Do not click links or open attachments unless you recognize the sender and know the content is safe.

You have permission, as requested today, to review and/or reproduce *The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care.* Click the link below to open.

The Iowa Model Revised (2015)

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**Citation:** Iowa Model Collaborative. (2017). Iowa model of evidence-based practice: Revisions and validation. *Worldviews on Evidence-Based Nursing*, 14(3), 175-182. doi:10.1111/wvn.12223

In written material, please add the following statement:

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Please contact UIHCNursingResearchandEBP@uiowa.edu or 319-384-9098 with questions.

Appendix E

### **Notice of Exemption**



Institutional Review Board 4201 South Washington Street Marion, IN 46953

Tel: 765-677-2090 Fax: 765-677-6647

## Implementing a Neonatal Abstinence Syndrome Toolkit to Improve Neonatal Intensive Care Nursery Staff Self-Efficacy, Knowledge, and Reduce Length of Admissions

Title of

Research Topic Maria Hughes Investigator(s) 1609.21 IRB ID Number

The IWU Institutional Review Board has reviewed your proposal and has determined that your proposal is exempt from further review by the IRB under Exemption Rule 2iii:

(2) Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met:

(iii) The information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by §ll.111(a)(7).

The limited review associated with this exemption accompanies this exemption letter. This exemption is valid for one year from the date of this notice. If there are any changes in the project during the year or if the project extends beyond the one-year period, the IRB must be notified.

Please note that this exemption regards only the oversight of human subject's research by the IRB. The IRB has not reviewed any other aspects of the research project and makes no judgement on the merits of the project or its methodologies. All research executed at IWU must conform to all applicable state and federal laws and regulations and to all applicable IWU policies.

bull Ph.D.

Chair, Institutional Review

June 28, 2021

Date

### Appendix F



### **Project Participant Consent Form**

Use this informed consent for studies beginning January 21, 2019 or later

Title of Project: Implementing A Neonatal Abstinence Syndrome Toolkit to

Improve Neonatal Intensive Care Nursery Staff Self-Efficacy, Knowledge, and

Reduce Length of Admissions

Principal Investigator's Name(s): <u>Maria Hughes</u> Project Advisor's

Name(s): Dr. R Hoffpauir Academic Division/Department: School of

Nursing/Doctor of Nursing

Section 1: Purpose of the Project

I understand the purpose of this project is to explore my perception of self-efficacy and knowledge of neonatal abstinence syndrome (NAS) care, implementation of a noninvasive comfort care toolkit (see Appendices A-C) for NAS infants and the education of families on the use of the toolkit.

I will educate families of NAS infants on the use of noninvasive comfort care strategies to be performed. The overall goal is to reduce NICU admission time for NAS infants whose families implement the toolkit care strategies.

I understand that staff training will include evidence-based noninvasive nursing comfort care strategies that I will teach to the families of NAS infants. These strategies will be evaluated by the project manager to determine effectiveness in decreasing length of admission stay for NAS infants.

I have read this page\_\_\_\_\_ (initials here) Continue to next page I understand that this is a quality improvement project lasting 15 weeks. I will be completing a voluntary pre-survey of general knowledge and self-efficacy related to NAS. I understand that I will be attending a training session with other members of the NICU team about evidence-based noninvasive nursing interventions and care plan documentation related to NAS.

I will engage in training staff and family members on the care of NAS infants (noninvasive patient comfort techniques). Selected NICU nurses will be trained on the implementation of the noninvasive comfort care toolkit by the project manager.

I understand that I will be responsible for implementing the toolkit (noninvasive comfort care strategies) into current practice on the NICU unit.

I understand that I will be asked for feedback post-implementation of the toolkit regarding self-efficacy and level of knowledge and the use of the toolkit.

I have read this page\_\_\_\_\_ (initials here) Continue to next page Section 3: Duration of Participation

The duration of this project is from June 2021 until the last week of September 2021. I understand the initial training session will last 30 minutes. There will be two optional 30-minute follow-up meetings in the subsequent weeks once the toolkit has been implemented on the unit.

I have read this page\_\_\_\_\_ (initials here) Continue to next page I understand the potential risks to participate are minimal. Answering questions about my self-efficacy and knowledge level could cause minimal emotional distress. I understand that the project manager is available for consultation anytime. I may choose to stop participation at any time without penalty.

I have read this page\_\_\_\_\_ (initials here) Continue to next page. Section 5: Benefits to the Individual or Others

I understand there are no direct benefits for participating in this project. The results of this project may provide a better opportunity to further my practice as a professional registered nurse.

Section 6: Compensation

I understand participants will receive no monetary compensation for being a part of the project.

Section 7: Extra Costs to Participate

Other than the cost of time for the participants, there are no costs to participate in the project.

Section 8: Injury or Illness

I understand no injury or illness is anticipated as a result of this participant in this project If a medical situation occurs during the project, 911 will be called.

Section 9: Confidentiality

I understand that to accommodate the desire for privacy and ensure anonymity, the project manager and the department manager will be the only ones with access to the completed survey results. Once the data is collected, it will be kept in a locked cabinet located in the manager's office until evaluation and analysis of data are completed. The project manager will maintain the confidentiality of the results. All signed survey sheets will be retained for a minimum of three years after close of the project by the project manager.

I have read this page\_\_\_\_\_ (initials here) Continue next page

### Section 10: Voluntary Nature of Participation

I do not have to participate in this quality improvement project. If I agree to participate, I can withdraw my participation at any time without penalty. My willingness to participate or not participate in the project will have no effect on my employment.

### Section 11: Release

I participate of my own accord in this project and release any claim to the collected data, project results, publication in any form including thesis/dissertation, journal article, conference presentation or commercial use of such information or products resulting from the collected information.

Section 12: Contact Information

If I have any questions about this project, I can contact:

Maria Hughes RN, MSN, MHA, NEA-BC Maria.hughes@myemail.indwes.edu

If I have concerns about the treatment of project participants, I can contact the Institutional Review Board (IRB) at Indiana Wesleyan University, 4201 South Washington Street, Marion, IN 46953. (765) 677-2090.

I HAVE HAD THE OPPORTUNITY TO READ THIS CONSENT DOCUMENT, ASK QUESTIONS ABOUT THE PROJECT AND AM PREPARED TO PARTICIPATE IN THIS PROJECT.

Participant's Signature:\_\_\_\_\_

I have read this page\_\_\_\_\_ (initials here) Continue to next page Participant's Name (Type or Print):\_\_\_\_\_

Date:

Investigator's Signature:\_\_\_\_\_

Date:\_\_\_\_\_

Note to Investigators: See following pages for additional instructions.

### Additional instructions for the Project Participant Consent Form:

You may also need to obtain dated consent for specific activities when those activities are *optional*. Whether an activity is required or optional must be clearly described in the main body of the consent above. Some common optional project activities are included below:

## Consent to be Audio/Video Recorded

I agree to be audio/video recorded.

YES\_\_\_\_\_NO\_\_\_\_\_

Signature

Date

## **Consent to Use Data for Future Projects**

I agree that my information may be shared with other project managers for future projects that may be similar to this project or may be completely different. The information shared with other project managers will not include any information that can directly identify me. Project managers will not contact me for additional permission to use this information. (Note: This separate consent is not necessary if you will only store and share de-identified data.)

YES\_\_\_\_\_NO\_\_\_\_\_

Signature

Date

## **Consent to be Contacted for Participation in Future Projects**

*I give the project manager permission to keep my contact information and to contact me for future projects.* 

YES\_\_\_\_\_NO\_\_\_\_\_

Signature

Date

## Participant to Initial and Date All Non-Final Pages

\* Please note that all consent forms that are longer than one page must provide a place for the participant to initial and date all non-final pages. A format such as the following may be added to the bottom of each non-final page:

I have read this page\_\_\_\_\_ (initials here) Continue next page

### **Electronic Consent**

Some studies allow for electronic consent, e.g. when potential participants are solicited through an email or social media. In that case, the preamble/cover letter/email should include all of the information contained in the above informed consent document template.

Additionally, the following clause or similar wording as befits the proposal shall be included in electronic informed consent documents if participants will take an electronic survey: "The survey is designed not to collect e-mail addresses or Internet protocol (IP) addresses. To further maintain confidentiality of the survey, please do not include your name or any other information by which you can be identified in any of the comment boxes in the survey."

Under no circumstances shall electronic informed consent be used for studies that include children under the age of 18 years.

An example of an electronic consent preamble template follows. Revise appropriately to fit your project, if applicable.

## 

## CONSENT FOR PARTICIPATION IN AN ELECTRONIC SURVEY SAMPLE

Hello, we are conducting a project about.... If you want to participate, please read the following consent document.

I certify that I am over the age of 18 and am participating in this survey of my own freewill. I recognize that some or all of the questions contained in this survey may be of a sensitive nature and may cause discomfort. I understand all survey answers will be held in strict confidence and may be used by the project manager for future publications.

I understand that the purpose of the project is to ....

I authorize (PI Names) of the Indiana Wesleyan University College/ School/ Division/ Department of ... program and any designated project assistants to gather information regarding my responses to questions asked on this survey. This survey will ask about understanding and perceptions of ... and will take approximately ... minutes/hours to complete. If I agree to take part in this project, I understand that I will be asked to complete the survey questions listed on the following pages. I understand that my responses will be utilized for the project and may become part of a published journal article or scholarly presentation.

I recognize that I will not receive monetary compensation for participating in this survey. Conversely, there are no monetary costs to me for participating.

I certify that my participation in this survey is wholly voluntary and recognize that I may withdraw at any time. I understand that I am free to skip any question I do not feel comfortable answering. There is no obligation for my participation and I may withdraw at any time.

I understand that (PI names) will be available for consultation should I have any additional questions regarding the project being conducted.

I understand that the answers given to this survey will be maintained by the project manager for a period of no less than three years after the close of the project. The project manager will store all paper copies of surveys in a locked and secured filing cabinet. Additionally, paper copies of surveys and release forms may be digitized and stored electronically on a password-protected hard drive.

I release any claim to the collected data, project results, publication of or commercial use of such information or products resulting from the collected information.

If I have any questions or comments about this project, I can contact:

- PI's name(s) and contact information, or
- Project manager and contact information.

If I have concerns about the treatment of project participants, I can contact the Institutional Review Board (IRB) at Indiana Wesleyan University, 4201 South Washington Street, Marion, IN 46953. (765) 677-2090.

The survey is designed not to collect e-mail addresses or Internet protocol (IP) addresses. To further maintain confidentiality of the survey, please do not include your name or any other information by which you can be identified in any comment boxes that may be included in the survey.

BY CLICKING ON "CONTINUE," I ACKNOWLEDGE THAT I HAVE HAD THE OPPORTUNITY TO READ THIS CONSENT FORM, ASK QUESTIONS ABOUT THE PROJECT AND AM PREPARED TO CONSENT TO MY PARTICIPATION IN THIS SURVEY.

## Tables

# Table 1

Descriptive Statistics for Self-Efficacy by Time Point: Questions 1-7 from ANKS survey

Time	Pre-te	Pre-toolkit		toolkit	t (38)	р
	trai	ning	training			
	М	SD	М	SD		
Nurses' Self-efficacy	5.77	0.42	6.61	0.32	0.85	<.0001
related to NAS						

content

*Note.* This table demonstrates that the nurses' self-efficacy improved by .85 points post-toolkit training. The self-efficacy mean score from the post-survey was higher post-training (Mean = 6.61, SD=0.32) compared to pre-training (Mean = 5.77, SD=0.42).
## Table 2

Open-ended Questions	Pre-toolkit Training		Cumulative Correct Responses (Percentage)	Post-toolkit Training		Cumulative Correct Responses (Percentage)
	Frequency	Percent		Frequency	Percent	
Question 8: Name one evidence- based <i>nursing</i> intervention routinely used in caring for infants with NAS and their families. Feed	5	13.16		8	21.05	
Hold	10	26.32		7	18.42	
Quiet/dark room	5	13.16		12	31.58	
Swaddle	9	23.68		9	23.68	
Medication	7	18.42		2	5.26	
Skipped	2	5.26		0	0	
			31 (86%)			36 (100%)

*Open-ended Question 8 to Determine Knowledge Level about NAS Pre and Post Toolkit Training from ANKS Survey* 

*Note.* This table demonstrates that the nurses had less incorrect responses post-toolkit training. The number of correct responses pre-training was 31 (86%); post-training correct responses were 36 (100%). Correct responses increased by 14%.

## Table 3

Open-ended Questions: Pre-toolkit Training	<b>F</b> actoria de la compañía de	Demonst	Constants	Gaussilari
	Frequency	Percent	Frequency	Percent
Question 9: Name 3 non- pharmaceutical evidence- based nursing interventions to use when caring for NAS infants.				
1 correct	11	28.95	11	28.95
2 correct	12	31.58	23	60.53
3 correct	7	18.42	30	78.95
Skipped	8	21.05	38	100
Open-ended Questions: <b>Post-toolkit Training</b> Question 9: Name 3 non- pharmaceutical evidence- based nursing interventions to use when caring for NAS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
infants.				
1 correct	5	13.51	5	13.51
2 correct	15	40.54	20	54.05
3 correct	17	45.95	37	100

*Open-ended Question 9 to Determine Knowledge Level about NAS Pre and Post Toolkit Training from ANKS Survey* 

*Note.* This table demonstrates that the nurses had less incorrect responses post-toolkit training. The number of correct responses pre-training was 30 (78.95%); post-training correct responses were 37 (100%). Correct responses increased by 18%.

## Table 4

*Open-ended Question 10 to Determine Knowledge Level about NAS Pre and Post Toolkit Training from ANKS Survey* 

Open-ended Questions: Pre-toolkit Training				
Tre-toolkit Training	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Question 10: Name 2			110000000	
techniques for motivational				
interviewing to use when				
caring for their families of				
NAS infants.				
1 correct	20	52.63	20	52.63
2 correct	3	7.89	23	60.53
Skipped	15	39.47	38	100
Open-ended Questions:				
Post-toolkit Training				
Question 10: Name 2				
techniques for motivational				
interviewing to use when				
caring for their families of				
NAS infants.				
1 correct	20	52.63	20	52.63
2 correct	18	47.37	38	100

*Note.* This table demonstrates that the nurses had less incorrect responses post-toolkit training. The number of correct responses pre-training was 23 (61%); post-training correct responses were 38 (100%). Correct responses increased by 39%.