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EDUCATIONAL INTERVENTIONS FOR REGISTERED NURSES TO IMPROVE COMPREHENSION AND ACCURACY OF THE NEONATAL ABSTINENCE SYNDROME TOOL IN NEWBORNS: A QUANTITATIVE STUDY

By

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Abstract

Does an Educational Intervention for Registered Nurses Improve Comprehension and Accuracy of Scoring the Neonatal Abstinence Syndrome Tool on Newborns?

This study aims to prove that improved comprehension of the Neonatal Abstinence Scoring Tool on neonates born to mothers with addiction will decrease the length of stay and decrease medical interventions. The Finnegan Neonatal Abstinence Scoring Tool consists of 21 questions with different symptoms, each associated with a number. This scoring is compared to determine the degree of learning or increase in knowledge after the educational presentation. Participants (*N*= 16) were recruited through a convenience sampling of registered nurses working at an acute care hospital in Northwest Arkansas on a Women's and Children's department. The participants completed a pre-questionnaire, attended an educational presentation about the NAS tool then took a post-questionnaire. The results of these questionnaires are favorable for re-education. For example, when participants were asked about *when you begin looking for signs of withdrawal* on the pre-questionnaire, only 35% answered correctly compared to 65% on the post-questionnaire. Additionally, when participants were asked if the *presentation on the use of the Finnegan Neonatal Abstinence scoring tool was helpful in my care of NAS infant*, 38% agreed, and 10% strongly agreed the presentation was helpful. In conclusion, there was an increase in the accuracy in the scoring of the Finnegan Abstinence Scoring tool after receiving the educational presentation.

Keywords: neonatal abstinence syndrome, neonatal abstinence syndrome scoring tool; accuracy of neonatal abstinence syndrome; neonatal abstinence syndrome education

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I. Introduction

When women addicted to drugs, particularly opioids give birth, the neonate is also born with this addiction. Subsequently, the sudden withdrawal of this drug could have adverse effects on the neonate. Romisher et al. (2018) surveyed nurses, advanced practice nurses, and nurse leaders at a regional neonatal nursing conference in the New England area; they reported that 50%-95% of infants are born to addicted moms. These infants may experience a drug-related withdrawal syndrome shortly after birth, and sometimes the consequences are harmful to the baby. This drug withdrawal syndrome, known as Neonatal Abstinence Syndrome (NAS), is "a multi-symptoms syndrome with abnormal symptoms of the central nervous, gastrointestinal, autonomic nervous, and respiratory systems presenting in the infant after a transfer of harmful substances from the mother to the fetus abruptly stops at the time of delivery" (Cook et al., 2017, p. 422). Essentially, the NAS newborn could experience many different physical symptoms, including “sleep disturbance, body tremors, a loss of muscle tone or an increase in muscle tone, and poor feeding” (Armbruster et al., 2021, p. 108). To allow medical professionals the ability to evaluate these NAS newborn symptoms properly, they rely on a tool. The most common tool used by healthcare providers to assess these withdrawal symptoms is the Finnegan Scoring Tool. Dr. Loretta Finnegan, MD, created the first NAS scoring tool in 1975. The scoring tool was modified in 2009 to evaluate intrauterine opioid exposure. The NAS tool is the most widely used tool for assessing neonates today (Armbruster et al., 2021). The Finnegan Scoring Tool evaluates a combination of 21 withdrawal symptoms and provides a severity score for the healthcare provider to determine medical

treatment. Each of these symptoms has a different score depending on the severity of the withdrawal.

Accurate scoring is vital in using the Finnegan Scoring Tool to improve the withdrawing infant's outcome. A 2015 study conducted in a Canadian hospital discovered that 53% of nurses received education about NAS scoring; however, the nurses lacked specific training on all the tools used with NAS, including the Finnegan Scoring Tool (Romisher et al., 2018). This failure to educate on the scoring tools used accounts for inaccurate scoring in neonates "The average inpatient length of stay for a neonate with NAS across the United States (U.S.) averages 16.4 days, compared to 2-3 days for the healthy term newborn" (Teague et al., 2018, p. 321). Inaccuracies in NAS scoring can increase the length of stay and emphasize the need for better training programs. According to Teague et al. (2018), the mean cost in the U.S. for neonates diagnosed and treated for NAS in 2009 was $720 million, averaging $43,000 or more per person compared to healthy term neonatal inpatient hospitalizations. A more recent study by Armbruster et al. (2021) found it costs an additional $12,075 per patient compared to non-NAS patients.

According to Gomez-Pomar et al. (2017), the nurses' competency for accuracy in scoring is a factor that cannot be thoroughly analyzed because multiple levels of severity need to be educated and understood. The variations in the severity of withdrawal leave room for subjectivity that can increase the variability of reported scores. Chin Foo et al. (2021) published a study on a Woman's and Children's unit in the mother-baby unit. Using an anonymous survey, the authors surveyed 41 nurses who administered the Finnegan Neonatal Abstinence Scoring system (FNASS). Choo Foo et al. (2021)

discovered the FNASS was "somewhat" to "very" subjective, with more than half (56%) reporting that the FNASS was "somewhat" accurate to "not accurate at all," and 90% thought that scoring in the moms' room compared to the nursery impacted the score. The nurses perceived subjectivity in scoring leads to inaccuracy in the scoring of withdrawing neonates.

McQueen and Murphy-Oikonen suggested the use of "protocols for its use (scoring tool) is required and should include training for staff members who perform newborn assessments. An interobserver reliability rating of 90% or greater is recommended among health care providers" (2021, p. 2472). In addition, the best way to decrease the number of errors in NAS scoring is for employers to commit to their employees both administratively and financially with ongoing population-specific continuing education (Teague et al., 2018). According to Timpson et al. (2018), after an excellent educational program, Nurses reported feeling more knowledgeable about different symptoms that may alter the neonates NAS scores and felt like they could score the neonate more accurately. Although 53% of nurses received education about NAS scoring without specific training on the Finnegan Scoring Tool, that is not enough, according to Romisher (2018). These educational interventions for nurses need to be used to improve comprehension and accuracy of the NAS scoring tool.

Need for Study

The need for consistent scoring tools and good training is evident in the inaccuracy in the use of the scoring tool. Increased education and training on the use of the NAS scoring tool and the symptoms are essential to better outcomes and increased accuracy. There have been several studies on using the NAS scoring tool and the results

of improving education for the nursing staff. Hwang et al. (2020) discovered an inconsistency in NAS scoring by nurses, associated with increased length of stay, higher healthcare costs, and an increased need for medical intervention. This inconsistency in scoring could be improved with an educational program for the nursing staff. The nurses must understand the institution's tool for withdrawing neonates and how they score using it. This inaccuracy in NAS scoring could lead to increased length of stay and emphasize the need for better training programs. In the years between 2000 and 2016, the incidence of NAS increased sevenfold, according to Chin Foo et al. (2021). The increase went from 1.2 to 8.8 per 1,000 hospital births between 2000 to 2016. The rise in NAS leads to approximately $2 billion in excess costs, primarily due to longer lengths of stay. Timpson et al. (2018), using a quality improvement program from UMASS, shows that with pre-training, a training period, and post-training assessment, they can improve the use of the scoring tool for a better outcome and better scoring. The study showed an increase from 18.8% pre-training on target scoring to 34.7%. The increase in accuracy by the nurses using the NAS scoring tool is encouraging after more education was provided. In a study at Yale-New Haven Children's Hospital, they found that in the U.S. from May 2015 to June 2016, the length of stay (LOS) for all infants with NAS decreased from 22.4 days to 5.9 days. The study found that proper education and evaluation helped reduce LOS (Grossman et al., 2018). It is evident from these studies that increasing the education on the use of the NAS tools in use has helped the nurses with increased comprehension and accuracy of scoring using the NAS scoring tool.

Statement of Purpose

This study aims to evaluate whether an educational intervention on the use and scoring of the NAS tool for infants addicted to opioids improves comprehension and accuracy of scoring the NAS by registered nurses. This education is needed to increase the knowledge of the nursing staff caring for these neonates to provide adequate care and improve scoring.

Research Question

Does an educational intervention for Registered Nurses improve comprehension and accuracy of scoring the neonatal abstinence syndrome tool on newborns?

Assumptions

One assumption for this study was that nurses fully participated in the educational intervention before completing the post-questionnaire. Another assumption was that all nurses who participated in this educational intervention work for the same institution, received the education offered, have neonatal experience, and all eligible nurses participated. It is also assumed that all the pre-and post-questionnaires answered in this educational presentation were answered truthfully.

Limitations

The limitations of this study would include the sample size. Although there were 150 eligible participants in this department, only sixteen participated in the pre-and post-questionnaire and the educational presentation. Another limitation is the perceived prior knowledge compared to new education. Many nurses that care for neonates feel that they have all the education they need and are not always receptive to new education or changes. The last limitation would be the short time the staff had to do the pre-

questionnaire prior to the educational presentation and the educational presentation. Another limitation is the perceived prior knowledge compared to new education. Many nurses that care for neonates feel that they have all the education they need and are not always receptive to new education or changes. The last limitation would be the staff's short time to do the pre-questionnaire prior to the educational presentation. Due to weather delays, there was limited time to disseminate information about the educational presentation. The information on this survey was distributed using flyers on the educational boards on each unit, a closed Facebook page for this department, and email and in-person invitations.

Definition of Terms

Finnegan Neonatal Abstinence Scoring System (FNASS): is the tool most widely used to evaluate NAS; it includes modification, a 31-item list of signs and symptoms of three dimensions of withdrawal; central nervous system disturbances; metabolic, vasomotor & respiratory, and gastrointestinal disturbances (Choo et al., 2021)

Neonatal Intensive Care Unit (NICU): Newborn babies who need intensive medical care are often put in a devoted area of the hospital called the neonatal intensive care unit (NICU) (*Stanford Children's Health,* 2022).

Neonate: a newborn child (*Neonate definition & meaning,* 2022).

Neonatal Abstinence Syndrome (NAS): a spectrum of clinical manifestations seen in neonates due to withdrawal from intrauterine drug exposure. It is more commonly associated with maternal opioid use (Anbalagan, 2021).

Summary

When assessing a neonate that is born to an addicted mom, it is vital that the proper scoring is completed by the nurse caring for this neonate. NAS scoring is subjective, and with proper education for nurses, it may decrease the subjectivity and lead to more accurate scoring. Increased accuracy could lead to better comprehension and accuracy in NAS scoring. An increase in accuracy could also lead to a decreased length of stay and the need for medical interventions.

II. LITERATURE REVIEW

This literature review aims to discuss the correlation between adequate education on Neonatal Abstinence Scoring (NAS) and nurses' comprehension and accuracy in scoring. The review utilized peer-reviewed journals from the years 2015 to 2021. The databases used in this study are PubMed, google scholar, Cumulative Index of Nursing and Allied Health Literature (CINAHL), ResearchGate, and journal articles retrieved from the Sigma Theta Tau (SIGMA) website and the OVID database through the Arkansas Tech University (ATU) library. The key search terms used were neonatal abstinence syndrome, neonatal abstinence syndrome scoring tool; accuracy of neonatal abstinence syndrome; neonatal abstinence syndrome education. The criteria for inclusion in this paper for this literature review are peer-reviewed articles within the defined years.

The first section is about neonatal abstinence education and the need for further education for nursing staff. The second section looks at the length of stay and treatment needed for NAS infants. The last section looks at the theoretical references that support the underlying framework for this project.

Finnegan Scoring Tool

The Finnegan Scoring Tool was developed in 1975 by Dr. Loretta Finnegan (Armbruster et al., 2021). "The Finnegan Scoring Tool was developed as both a clinical and research tool for evaluating intrauterine opioid exposure in term infants" (Armbruster et al., 2021, p. 107). The Finnegan Scoring Tool was later modified in 2009 to make it easier to use by shortening the number of questions (Armbruster et al., 2021). This tool consists of 21 questions that evaluate different symptoms that affect the "gastrointestinal, respiratory, autonomic, and central nervous system disturbances" (Gomez-Pomar et al.,

2017, p. 107). Each of the 21 symptoms accounts for a different point value depending on the severity of the symptoms. The scored point values are added, and the total points at the end of the twenty-one symptoms will depend on the need for intervention. The scoring for each symptom is subjective, and with improper education, the nurse may score the neonate inaccurately, either high or low.

Proper education on scoring with the Finnegan Scoring Tool is vital for each nurse. According to Gomez-Pomar et al. (2017), nursing competency for scoring is a factor that cannot be thoroughly analyzed because multiple levels of severity need to be educated and understood. These levels leave room for subjectivity, which can increase the variability of reported scores. The average cost associated with each NAS admissions cost is an additional $12,075 per patient compared with matched non-NAS control, according to Armbruster (2021). Another study at the Yale-New Haven Children's Hospital found that their average length of stay was 22.4 days between January 2008-February 2010; after re-education, the average length of stay decreased to 5.9 between May 2015 to June 2016 (Grossman et al., 2017). Length of stay can be decreased with increased education on the scoring tool used, which will lead to improved scoring by the nursing staff.

There is a need to assess the nurses' understanding of withdrawal. According to McQueen and Murphy-Oikonen (2016), there continue to be gaps in education that include a lack of clarity and consistency in how the syndrome is defined, measured, and managed. The following literature review confirms the need for proper educational intervention for registered nurses; there will be improved comprehension and accuracy of the Neonatal Abstinence Scoring Tool (NAS) scoring on newborns. This increase in

accuracy will decrease the length of stay and decrease the need for medical interventions.

Neonatal Abstinence Education

Proper education is vital in the care of withdrawing neonates, according to a study published by Chin Foo et al. (2021) in a hospital in Providence, Rhode Island, on a Woman's and Children's unit in the mother-baby unit. Using an anonymous survey, the authors surveyed 41 nurses who administered the Finnegan Neonatal Abstinence Scoring system (FNASS). In the years between 2000 and 2016, the incidence of neonatal abstinence syndrome (NAS) increased sevenfold, according to Chin Foo et al. (2021). This increase went from 1.2 to 8.8 per one thousand hospital births between 2000 to 2016. The increase in NAS leads to approximately $2 billion in excess costs, primarily due to longer lengths of stay. In a survey in Providence, Rhode Island, found that "All the nurses found that the FNASS was "somewhat" to "very" subjective with more than half (56%) reporting that the FNASS was "somewhat" accurate to "not accurate at all" and 90% thought that scoring in the moms' room compared to the nursery impacted the score" (Choo Foo et al. 2021, p. 3). The study concluded there was a need to improve nurses' ability to assess and manage NAS and develop a standard of care model.

In another research study, Romisher et al. (2018) stated that approximately 50%-95% of infants who developed and were subsequently diagnosed with NAS experienced drug withdrawal shortly after birth. Romisher et al. (2018) evaluated past literature reviews and noticed a lack of NAS-specific education and training. Romisher et al. (2018) narrowed their research to a survey done in Canada in 2015 and found that only 53% of NICUs studies provided education to their nurses regarding the care of infants

with NAS; they concluded that nurses need training on the specific tool used. When there was an increase in the education and training provided, Romisher et al. (2018) found an increase in knowledge and reliability with training videos, but they did not evaluate the reliability of this tool. Romisher et al. stated that "The majority of participants felt that they were knowledgeable about NAS (93%), and they believed that the scores assigned to the affected infants were accurate and objective (70%)" (2018, p. E6). Many of the nurses interviewed thought they had received enough education, but further studies are needed to evaluate their competency. This study shows that nurses feel that they believe they can more accurately score neonates that are withdrawing with increased education.

Timpson et al. (2018) used a systematic, nonexperimental adaptive-design study to look at the quality of NAS scoring, by the nursing staff, at the University of Massachusetts Memorial Medical Center Neonatal Intensive Care Unit (UMASS). Timpson et al. (2018) stated that the rate of NAS diagnosis among at-risk newborns is highly variable, with estimates as low as 13% and as high as 94%. Estimates vary between 30% and 95% among infants requiring pharmacotherapy for withdrawals. The considerable variation is worrisome for the possibility of treating infants that may not need to be treated. According to Timpson et al., nurses reported feeling more knowledgeable about conditions that may alter infants' scores unrelated to NAS; they felt more confident in accurately scoring withdrawal symptoms because they better understand their condition (2018, p.75). A quality improvement program implemented by UMASS included: pre-training the nurses to watch a 7-minute video on mute depicting signs of withdrawal and scoring them accordingly. The next step was a training period that included hands-on time with a trainer and a bedside reference guide for continued

use. Post-training the nurses watched the same video again and were asked to score the infant in the video. The quality improvement programs from UMASS show that with pretraining, a training period, and a post-training assessment, they can improve the outcome for better scoring. This study showed an increase from 18.8% pretraining on target scoring to 34.7% at the target rating post-training. This study shows that nurses increase accuracy when more education is given.

Delvin et al. (2020) reviewed medical records at the Universities of Louisville and Kentucky to assess the comprehension of the NAS tool used and the accuracy of the scores. Devlin et al. (2020) stated that the differences between raters in the assessment of NAS had been associated with significant differences in initiation and duration of pharmacologic therapy, length of hospital stay, and health care utilization. The authors stated that this difference could be minimized with a comprehensive educational approach that optimized and maintained interobserver reliability.

Armbruster et al. (2021) performed a cross-sectional study in NICUs in U.S. and Canada from May to September 2018. The authors also looked at the education of nurses and the tool used to score withdrawing neonates. Armbruster et al. stated, "there are extensive knowledge gaps; therefore, it is important to establish an assessment of the current practice" (2021, p. 108). The thought is that the educational program should be used to re-educate all the nursing staff. The educational program should include a pretraining assessment, retraining, and a post-training assessment. It was reported that NICUs report using the signs and symptoms being present as a trigger to start scoring and not just the presence of moms' history of drug use. It was noted that the neonate's gestational age helped decide the treatment used.

McQueen and Murphy-Oikonen's study which included England, Canada, and Western Australia, reflected an increasing global problem. This study concluded that identifying infants at risk for neonatal abstinence syndrome is vital for ensuring accurate clinical assessment, promoting early intervention, and mitigating newborn withdrawal signs. The authors stated that the subjectivity in the tool was a concern and that their reliability and validity vary. The suggestion by the authors was to use "protocols for its use (scoring tool) are required and should include training for staff members who perform newborn assessments; an interobserver reliability rating of 90% or greater is recommended among health care providers" (2016, p. 2472). Proper education will decrease the concerns of poor training and inaccuracy in scoring. This proper education could help promote the average growth and development of neonates by decreasing the adverse outcomes associated with withdrawal and improper treatment.

The Length of Stay and Treatment

The average length of stay (LOS) for neonates with NAS across the U.S. average 16.4 days, compared to 2-3 days for a healthy newborn, according to Teague et al. (2015). The author also stated that the average cost in U.S. hospitals to treat NAS in 2009 was $720 million. Teague et al. (2015) found that the best way to decrease these numbers is for employers committed to the ongoing population-specific continuing education for neonatal clinical nurses. The authors stated that the risk for NAS extends well beyond the immediate neonatal period, requiring ongoing observation and management by clinicians. According to Teague et al. (2015)," a quality improvement initiative should be implemented in the neonatal population to improve care and decrease cost"(p. 326). The authors also stated that each nursery needs a standard policy on implementing its scoring

tool. This streamlined set of policies would decrease institutional costs and length of stay by improving education and scoring for each neonate.

A multidisciplinary team at Yale-New Haven Children's Hospital looked at LOS for NAS infants. Grossman et al. (2021) stated that using quality improvement methodology to improve the care of infants with NAS led to substantial and sustainable decreases in LOS far beyond their goal of 50%. They noticed a reduction in the use of morphine. They found that in the U.S., from 2009 to 2021, the LOS for all infants with NAS was 17 days; infants requiring pharmacologic interventions had an average LOS of 23 days. They found that they reduced the LOS to 5.9 days on average with proper education and evaluation. This study also cited a decreased use of pharmacologic interventions.

A study was performed between April 2017 and December 2019 at a Colorado Hospital that assessed substance-exposed newborns using a quality improvement collaborative. The collaboration consisted of neonatal providers, public health experts, and legislative experts. The study authored by Hwang et al. (2020) found that using quality improvement methods, interventional tool kits, webinars, and in-person summits helped reduce the LOS in Colorado Hospitals. The authors found that when a hospital increased the consistency in their assessment for NAS, they educated on the tools used to evaluate NAS infants. The hospital developed local improvement teams focused on these neonates and their families. The authors found that the increase in education led to increased consistency in assessing NAS. This study found that they had a decrease in LOS and a reduction in medication therapy.

Theory

Theory is an integral part of nursing, and many different theorists helped make nursing what it has become. One of the theorists that help nursing care for withdrawing neonates is Faye Abdellah's nursing care plan and the twenty-one nursing problems theory of nursing. According to Abdollah's Twenty-One Nursing Problems Theory of nursing, "Nursing is based on art and science that molds the attitudes, intellectual competencies, and technical skills of the individual nurse into the desire and ability to help people, sick or well, cope with their health needs" (Petiprin, 2019, para. 1). The twenty-one nursing problems include ten steps, but only the first four steps are addressed in this paper. n generalizes the available data concerning similar nursing problems; in the case of a NAS baby, this is using your education to score the infant using the NAS tool. The NAS tool helps the nurse gather data and make a generalized assessment based on this score. The symptoms are used to determine the plan of treatment in step four. The NAS tool helps the medical team evaluate if the neonate is withdrawing and if it is what the next step should be to care for this neonate. This theory emphasized the need for knowledge, resources available to nursing, and nursing procedures. The Twenty-One, Nursing Problems Theory is significant in NAS infants because it gives nurses a path to follow as they are skilled in using the scoring tool. This increase in skills will increase accuracy in scoring, decrease the need for medical interventions, or increase LOS.

Faye Abdellah utilizes a problem-solving approach to nursing to improve the health needs of people (Petiprin, 2019). Dr. Abdellah helped guide nursing to focus on healing patients, not just treating them. It is the belief that nurses do not just treat patients; they need to understand what is wrong with their patients to heal them and

decrease harm. Mehraeen et al. (2020) stated that one of the persistent problems in nursing is the weakness of clinical observation, collecting accurate data, and identifying and solving their patients' problems. Mehraeen et al. (2020) used Faye Abdellah's Twenty-One Nursing Problems Theory to understand the symptoms and illness of a patient with abdominal pain at a hospital in Poursina in the city of Rasht, the capital city in Gilan Province, Iran. The authors used Abdellah's Twenty-One Nursing Problems Theory and a physical exam to determine the appropriate diagnosis for this patient. The staff formed a plan of care using Abdellah's Twenty-One Nursing Problems Theory to find a differential diagnosis. Each of the twenty-one nursing problems was addressed in this case study, and the nurses produced a proper framework to diagnose the nursing problems.

Faye Abdellah's problem-solving theory helps nursing understand the need for further education using of the NAS scoring tool and the need to understand the symptoms related to the proper care for a neonate with withdrawal symptoms by understanding scoring, patient evaluation, and the need for possible treatment. Faye Abdellah's problem-solving theory helps nursing understand the need for further education using of the NAS scoring tool and the need to understand the symptoms related to the proper care for a neonate with withdrawal symptoms by understanding scoring, patient evaluation, and the need for possible treatment.

Summary

There are 21 questions that the Finnegan Neonatal Abstinence Scoring Tool uses to evaluate the level of withdrawal in a neonate. The NAS tool takes each symptom and provides a score used to rate the level of withdrawal, and if you do not understand what

each symptom represents, the scores could be accurate. In a survey by Romisher et al. (2018) in Canada in 2015, they found that only 53% of NICUs studies provided education to their nurses regarding the care of infants with NAS. Continued education on the use of the NAS tool increased the nurse's knowledge and accuracy in the use of this tool. The confidence felt with the increased accuracy leads to better care for our neonates and a possible decreased length of stay (LOS) due to a decreased need for medical intervention. The average LOS from 2009 to 2021 was 17 days; according to Grossman et al. (2021), this was reduced to 5.9 days after a re-education program that assisted the nurses in understanding the scoring process.

The Twenty-one Nursing Problems Theory created by Faye Abdellah exemplifies the nurses' need for continued education on the tools needed to care for their patients. Abdellah's theory also helps the nurses understand that we cannot just treat patients; we need to understand what is wrong with their patients to heal them.

III. METHODOLOGY

Research Design

The quantitative research study was used to assess the effect of education using the NAS scoring tool using a convenience sampling of all full and part-time nursing staff at an acute care hospital in Northwest Arkansas. This study used a pre-assessment and post-assessment questionnaire to determine the effects of an educational program on Neonatal Abstinence Syndrome (NAS) scoring. A Quantitative research study investigates a phenomenon that lends itself to precise measurements and quantifications, often involving a rigorous and controlled design and statistical data analysis (Polit & Beck, 2021). This design is the best choice for this study because it allowed the ability to evaluate whether an educational intervention on the use and scoring of the Neonatal Abstinence Syndrome (NAS) tool for infants addicted to opioids improves comprehension and accuracy of scoring the NAS by registered nurses.

Research Question

Does an educational intervention for registered nurses improve comprehension and accuracy of scoring the neonatal abstinence syndrome tool on newborns?

Setting

The setting for this study was a 252-bed acute care hospital in Northwest Arkansas on the Women's and Children's department consisting of four units. Specifically, these four units were included: a) Labor and Delivery with 20 beds, b) Mother/Baby with 34 beds, c) Pediatrics with 10 beds, and d) a level IIIB Intensive Care Nursery Unit (NICU) with 21 beds.

Sample

The population of interest for this study was all the nurses working in a Women's and Children's department at an acute care hospital in Northwest Arkansas. Each nurse in these units provides care for neonates daily. This convenience sample of nurses was recruited via flyers, social media, in person, and email. The research study was explained at the time of recruitment. The flyers were placed on the education boards in each unit's breakrooms giving information about the survey and the educational presentation. There was also a post on the two closed Facebook pages used by the nurses of these areas inviting them to participate in the survey. Some nurses, who are not on Facebook, received an in-person or email invitation explaining the study and a link to the questionnaire and consent. The nurses were instructed to use a link to the questionnaire located and secured on QuestionPro.com to track the results. The participants were instructed to take the pre-assessment questionnaire prior to the educational presentation. Before initiating the questionnaire, participants were provided with informed consent. Participants were enrolled in the study if they volunteered to participate in this study by selecting, *I consent* or *exit* Question Pro if they did not consent. The next step for the participants was to attend the educational presentation that contained a PowerPoint about Neonatal Abstinence and the scoring of neonates. The last step for this study was to complete the post-assessment questionnaire. The pre-and post-questionnaires were compared to each other.

Human Subjects

The application for Review of Human Subjects Research was approved prior to the beginning of the study by the Institutional Review Board (IRB) at Arkansas Tech University (See Appendix A). The application also contained a copy of the informed consent posted on the questionnaire on QuestionPro.com. The requirement for the IRB application included a detailed problem, purpose, and research question. It also required a description of the participant samples, recruitment information, and data collection procedures. The information provided was required to be specific and detailed. The application was submitted on January 20, 2022 and approved on February 15, 2022. Informed consent was given at the beginning of QuestionPro.com through a survey link prior to the questionnaire. Each participant was given a choice: I consent or exit Question Pro if they did not consent. The questionnaires and educational program were voluntary with no repercussions if they did not participate or withdraw from the program. The participants could choose not to answer questions if they chose not, and confidentiality was ensured using the Respondent Anonymity Assurance (RAA) setting on QuestionPro.com. QuestionPro.com was used, and anonymity is guaranteed to the greatest extent possible. There was no direct or indirect coding, link, or awareness of who participated in the study, including no collection of IP addresses for electronic methods and RAA setting enabled. This information was not published and was not used to discover more information from the participants. Data were kept on password-protected devices and accounts. Participation in this study was completely voluntary and did not affect their employment status with Mercy Health System of Northwest Arkansas.

The self-created questionnaires based on current literature were housed on QuestionPro.com and consisted of a pre-and post-questionnaire. This questionnaire consists of 5-point Likert scale questions, a case study, and demographic questions. The six demographic questions requested information about participants' age, gender, education, work environment, and experience as neonatal nurses. The demographic questions provided the participants with a nursing background, years of nursing and years working on Women's and Children's, and work experience, where they currently work in the department. There are five questions on the pre-questionnaire related to the nurse's previous knowledge of NAS, belief on where these neonates should be cared for, and the need for further education on the NAS tool. These questions used a 5-point Likert scale that ranged from 1= strongly disagree to 5= strongly agree. On the post-questionnaire, the participants were asked if the presentation was helpful using the same 5-point Likert scale. The remaining 27 questions are topic-specific questions regarding neonatal abstinence syndrome. Included in this is a case study with six questions where the nurse decides on the score of the neonate and what to do with the score. These case study questions are used on the pre-and post-questionnaire to evaluate if the educational presentation was helpful. The desire is for accuracy in the scoring to improve on the post-questionnaire.

Educational Interventions

The primary investigator presented the educational intervention to the nurses who volunteered to participate in this study. This presentation was offered in the morning and the evening for the convenience of nurses that work during the day or night. The educational presentation began with an overview of drug withdrawal in the U.S. and

Arkansas, along with thoughts on nursing biases of addiction and the pathophysiology of NAS. This educational presentation details the NAS scoring tool and how to interpret the scoring tool; in addition, there was an education on NAS symptoms, what the symptoms looked like, and how to score the neonate for each symptom. During this withdrawal period, care for these neonates was also discussed, along with how best to help the parents care for their neonates during this process. Throughout this presentation, questions were answered about how to score a neonate, what to do with the score and what to inform the physician about the scoring. This educational presentation lasted for 45 minutes, with an additional 15 minutes in the end for questions.

Data Collection

The participants were given a link to the pre-questionnaire on QuestionPro.com a week before the educational presentation. They were asked to complete this survey prior to the educational presentation. This pre-questionnaire will evaluate the current knowledge of the nurses participating. After the educational presentation, the participants were given a different link to the post-questionnaire. They were instructed to complete it within the week of the education. The post-questionnaire data was used to evaluate if there is an increase in accuracy.

Data Analysis

The method for data analysis used for this survey is descriptive statistics. Descriptive statistics refers to concepts and methods used in organizing, summarizing, tabulating, depicting, and describing data collections (Bui, 2020, p. 171). The pre-and post-questionnaire was completed on QuestionPro.com. The data questionnaire was compiled using Excel, and SPSS Statical analysis using SPSS and Excel was used to

compare and measure the mean and standard deviation. Descriptive statistics discussed the participants' findings regarding demographic data, topic-specific data, and a case study. Tables and figures are also provided. The nine control questions are used to determine if there was an increase in knowledge.

Summary

This quantitative research study was given to a voluntary group of nurses at an acute care hospital in Northwest Arkansas on a Women's and Children's department. The convenience sample of n=16 nurses from the four units within the Women's and Children's department was recruited using flyers in the breakroom, a Facebook post on a closed unit Facebook page, and email and in-person invitations. This quantitative pre-and post- questionnaire was designed using an educational presentation to determine if proper education improves the nurses' knowledge and accuracy of scoring. The data were collected using QuestionPro.com with a link to a pre- and post-questionnaire completed at specific times during the study. Specific questions from the pre-and post-questionnaire were compared to determine if the participants increased accuracy in the scoring using the NAS tool.

IV. Results

Results

In this chapter, the results of the pre-and post-questionnaires determine if the educational intervention improved the nurse's comprehension and accuracy using the Neonatal Abstinence scoring tool. Nurses from the Women's and Children's Department at an acute care hospital in Northwest Arkansas were asked to participate in this study. All 150 nurses on the Women's and Children's departments were invited to participate in this study. However, only 62 nurses accessed the pre-questionnaire, but only $N=$ 16 nurses completed the pre- and post-questionnaire and participated in the educational intervention. The sample size for this study was $N=16$, with a completion rate of 100%. This chapter presents the demographic results first and then the results of the pre-and post-questionnaires.

Demographic Results

The first three demographic questions assessed *the age of the participants and their years of practicing as a nurse, and their work experience.* The participants range in age from early '20s to mid to late '60s. The findings indicate that most participants are 31-40 years of age (25%, $n=8$) or 51-60 years of age (25%, *n=8).* The findings indicate that the participant's years of practicing as a nurse range from two to over 41 years. Many of these nurses have worked for 11-20 years and 21-30 years (31%, *n=5)* for each group). The participants' experience on Women's and Children's (W/C) varies from 0-1 year to more than 41 years. Most of the nurses have between 11-20 years (*n=6 or 38%*), with one participant in each of the following groups at 21-30 years, 31-40 years, and 41 or more years.

The following demographic question asked was their *highest level of education.* There were a variety of education levels in this department. The majority of the nurses have a Bachelor's degree (*n=8 or 50%*), followed by an Associate degree (*n*=4 or 25%), and Diploma (*n*=2 or 12.5%), LPN/LVN *(n*=1), and Advanced Practice Nurse (*n*=1). The last demographic question asked was *what department each participant's primary work area;* 56% (*n=9)* work in the Neonatal Intensive Care Unit, 25% *(n=4)* work on Pediatrics, and 25% (*n*=2) in Labor *a*nd Delivery. Although these nurses all have a different primary work area, they all care for neonates daily. See Table 1 for the demographic results.

Table 1

Summary of Demographic Results

N=16 Characteristics	***n= Participants***	**% of Participants**
What is your current age:		
20-30	0	18.75%
31-40	4	25%
41-50	3	18.75%
51-60	4	25%
61 or more	2	12.5%
How many total years have you been nursing		
0-1	0	0%
2-5	4	25%
6-10	0	0%
11-20	5	31.25%
21-30	5	31.25%
31-40	0	0%
41 or more	2	12.5%
How many years have you worked on a Women's and Children's unit		

0-1	2	12.5%
2-5	3	18.75%
6-10	2	12.5%
11-20	6	37.5%
21-30	1	6.25%
31-40	1	6.25%
41 or more	1	6.25%
What is your highest level of education		
LPN/LVN	1	6.25%
Diploma Nurse	2	12.5%
Associate Degree Nurse	4	25%
Bachelor's Degree Nurse	8	50%
Master's Degree Nurse	0	0%
Advanced Practice Nurse	1	6.25%
Other	0	0%
Primary work setting		
Neonatal Intensive Care Unit	9	56.25%
Mother/Baby	1	6.25%
Labor and Delivery	2	25%
Pediatrics	4	25%

Pre-Questionnaire Results

The participants were asked to take a pre-questionnaire survey to assess their knowledge prior to attending the educational presentation. The pre-questionnaire consists of multiple-choice, true/false, and Likert scale questions. These questions will help determine the nurses' prior knowledge and understanding of the etiology of a withdrawing neonate and the use of the FNAS tool. There are 13 multiple-choice and true/ false questions on the pre-questionnaire (questions 14 through 30) reported in Table 2. These multiple-choice and true-false questions are used to see if the nurses understand the symptoms associated with a neonate suffering from withdrawal. In Table 2, the pre-

questionnaire questions are listed with the percentage of nurses who answered correctly and those who did not. The results indicated that almost every question was answered correctly, except for one question. Question 27 asked *When do you score this baby again*, this question referred to when a nurse would do a reassessment of the score after interventions such as feeding and diaper change. The correct answer was one hour, only 56% *(n*=9) answered incorrectly, and 44% *(n=7)* answered correctly. The next set of questions 34 through 39 on Table 2 are true/false questions. These questions are basic questions about scoring and taking care of a withdrawing neonate. The one question that was split evenly was the last question that asked; *Newborn opioid withdrawal syndrome can be described as physical signs and symptoms of withdrawal in newborns when prenatally exposed to any substance other than opioids*. The nurses were exactly split on this question, 50% true and 50% false; both answers could be correct. A neonate can withdraw from other substances and not just opioids. The solution that was desired is false, but it is easy to see why some nurses answered true.

Table 2

Pre-Questionnaire Multiple Choice and True False

N=16 Question	***# Of Correct***	***# Of Incorrect***
14. What are the usual neurologic symptoms in an infant suffering from withdrawals?	15 (93.8%)	1 (6.3%)
15 What are the usual gastrointestinal symptoms in an infant suffering from withdrawal?	13 (81.3%)	3(18.8%)
16. What are the usual autonomic symptoms in an infant suffering from withdrawal?	14(87.5%)	2(12.5%)
18. How do you score excoriation in a NAS infant?	13(40.6%)	3(18.8%)

19. What is excessive crying in a NAS infant?	14(87.5%)	6.3(12.5%)
20. What is a positive Moro in an NAS infant?	11(68.8%)	5(31.3%)
21. Your NAS baby sneezed 4 times in a row and is sweating despite having only a light swaddle on. Is your baby displaying signs of withdrawal?	15(93.8%)	1(6.3%)
22. Your baby is sucking continuously on a pacifier but unable to coordinate during feeds. Are these signs of withdrawal?	14(87.5%)	2(12.5%)
23. What can we do to help babies with withdrawal symptoms?	14(87.5%)	2(12.5%)
24. A patient is admitted in labor with a distant history of drug abuse. This admission she has had limited prenatal care and has sore on her body. Which of the following would you do?	12(75%)	4(25%)
27. When do you score this baby again?	7(43.8%)	9(56.3%)
29. What do you do with this number?	15(93.8%)	1(6.3%)
30. What might the physician want to know when you call?	14(87.5%)	2(12.5%)
T/F 32. If the infant has a 2 or more consecutive scores of 8 or higher the infant should be evaluated for further treatment	14(87.5%)	2(12.5%)
33. Non-pharmacological soothing strategies for managing Neonatal Abstinence Syndromes include swaddling, diaper change, feeding, and skin-to-skin contact.	13(81.3%)	3(18.8%)
T/F 34. Having biased and preconceived notions about substance use will make a person more effective at caring for an infant with Neonatal Abstinence Syndrome and their mom.	14(87.5%)	2(12.5%)
T/F 35. A full-term baby might be awake before 3 hours and ready to feed, is this a sigan of withdrawal?	15(93.8%)	1(6.3%)

T/F 36. If the baby spit up after a feed once but is calm and content the rest of the time, will you consider this baby a withdrawal baby?	15(93.8%)	1(6.3%)
T/F 37. It is possible for a baby to have some symptoms of withdrawal but the mom is not an addict to opioids.	14(87.5%)	2(12.5%)
T/F 38. Neonatal Abstinence Syndrome can be described as a set of neurobehavioral and physical signs of withdrawal from substances that an infant may exhibit if prenatally exposed to substances.	14(87.5%)	2(12.5%)
T/F 39. Newborn opioid withdrawal syndrome can be described as physical signs and symptoms of withdrawal in newborns when prenatally exposed to any substances other than opioids.	8(50%)	8(50%)

The last three questions only on the pre-questionnaire use a Likert scale. The scale uses the standard 5- point ranging from strongly agree to strongly disagree. The nurses were asked *if they have enough knowledge about NAS to provide adequate care for affected infants.* The result for question seven indicated that 44% (M = 3.88, SD = 0.885) of nurses strongly agree that they have enough knowledge, but 25% were either neutral or strongly agree. The next question asked *I believe NAS infants should be cared for in NICU.* The result for this question found 38% (n= 6) of nurses agreed (M = 3.25, SD = 0.931), that *withdrawing babies should be cared for in the NICU*, 25% (n=4) disagreed, 31%(n=5) remained neutral. The final Likert scale question asked only on the pre-questionnaire was *I feel I need more education on the FNAS tool*, 44% of the nurses agreed that they needed more education with the M=3.54 and an SD of 0.877. Interestingly enough, only 15% (n=2) disagreed *(*M=3.54 and an SD of 0.877) and felt they had enough education (See Table 3).

Table 3

Pre-Questionnaire Likert Scale

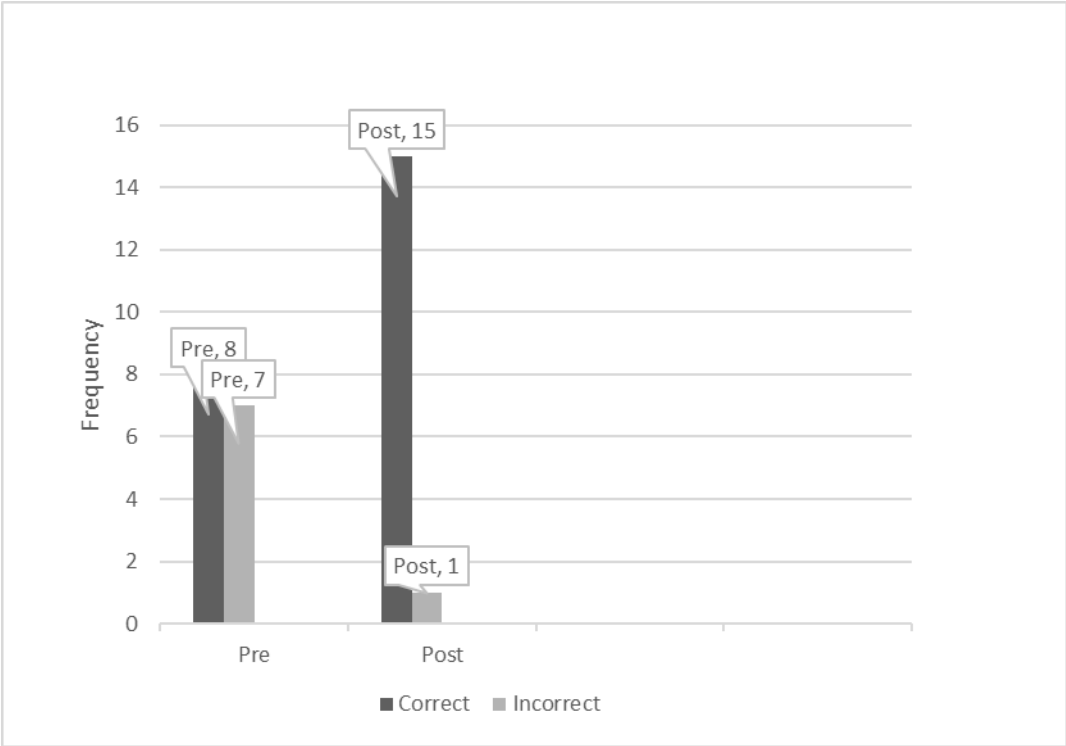
N=16 **Questions**	***M***	***SD***	***Percentile***
Q7, I have enough knowledge about NAS to provide adequate care for affected infants	Valid 16 M=3.88	0.885	25%-3.00 50%4.00 75%4.75
Q8, I believe NAS infants should be cared for in NICU	Valid 16 M=3.25	0.931	25%-2.25 50%-3.00 75%4.00
Q9, I feel I need more education on the FNAS tool	Valid 16 M=3.54	0.877	25%-4.00 50%-4.00 75%4.00

Pre- and Post-Questionnaire

The next set of findings reported is the comparative results from the pre-and the post-questionnaire. The primary investigator opted to only use 10 questions from the pre-questionnaire due to the length of the pre-questionnaire. The same nurses (N = 16) completed the pre-and post-questionnaire. The first set of reviewed data are all multiple-choice questions 13 through 24. The participants were asked when *symptoms usually appear in NAS infants*. The scores on the pre-questionnaire were 38% (n=8) correct, and on the post-questionnaire, the correct score was 65% (n=15) (See Figure 1). The data indicated an increase in knowledge by 27%. The education did appear to improve the scores in this category.

Figure 1

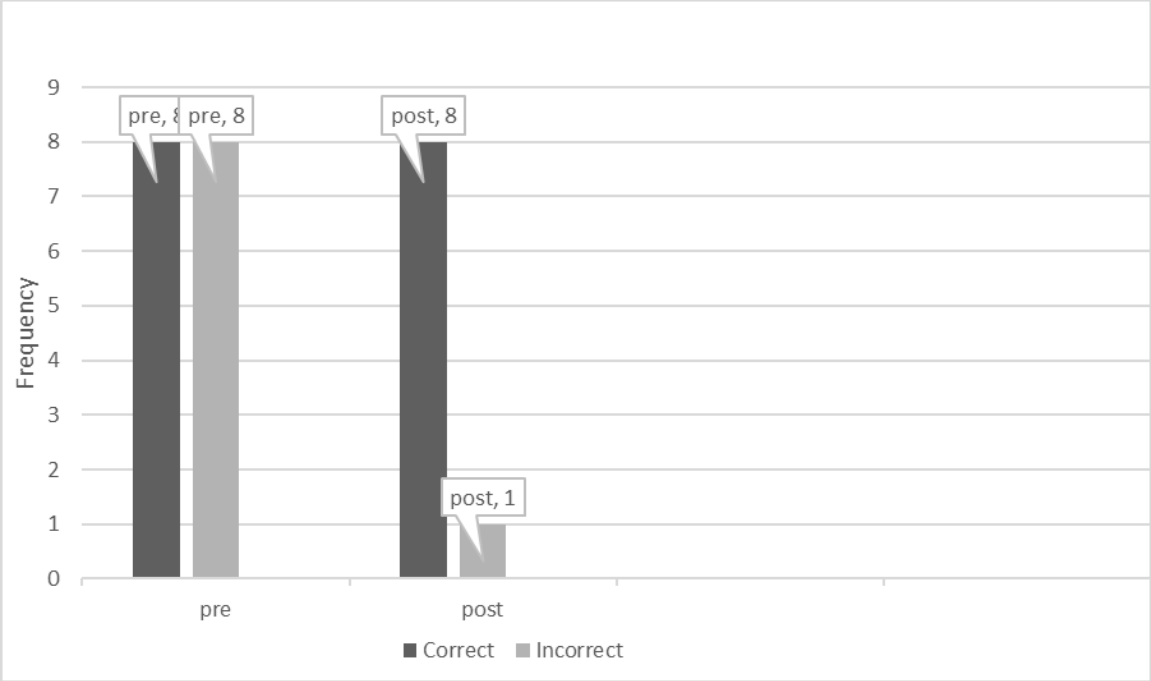
When do Symptoms Usually Appear in NAS Infants



The next question addressed asked *How long after a feed before you can score an infant.* On the pre-questionnaire the participants scored 35% (*n*=8) correctly. On the post-questionnaire, the participants scored 65% (*n*=15). These results show that the nurses had an improvement in scores post-education (See Figure 2).

Figure 2

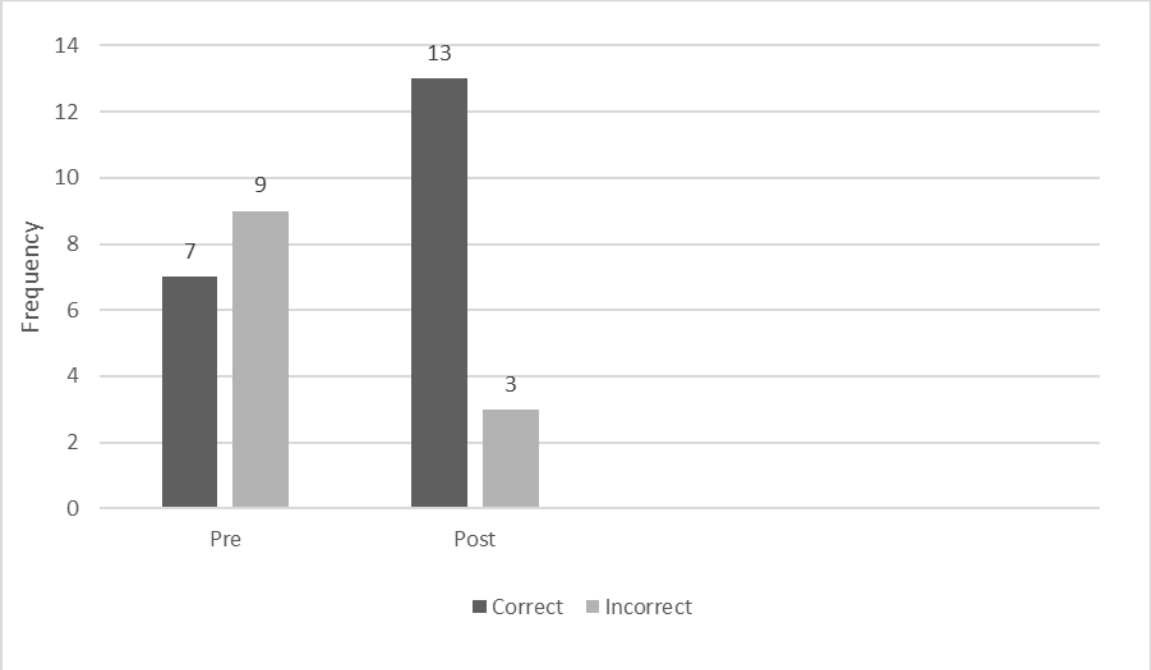
How Long After a Feed Before You Can Score an Infant



The case study questions involved a NAS neonate; this is the scenario given *you have a baby (that is 37 weeks gestation) on the mother/baby unit. The urine on Mom was positive for methamphetamines and THC. The nurse collected urine on the baby, which returned positive, and the umbilical cord was sent for testing per hospital policy*. The first question asked about this scenario is *when do you begin looking for signs of withdrawal*. Only 35% (*n*=7) correctly answered this multiple-choice question on the pre-questionnaire. After the educational presentation, 65% (*n*=13) answered correctly (See Figure 3).

Figure 3

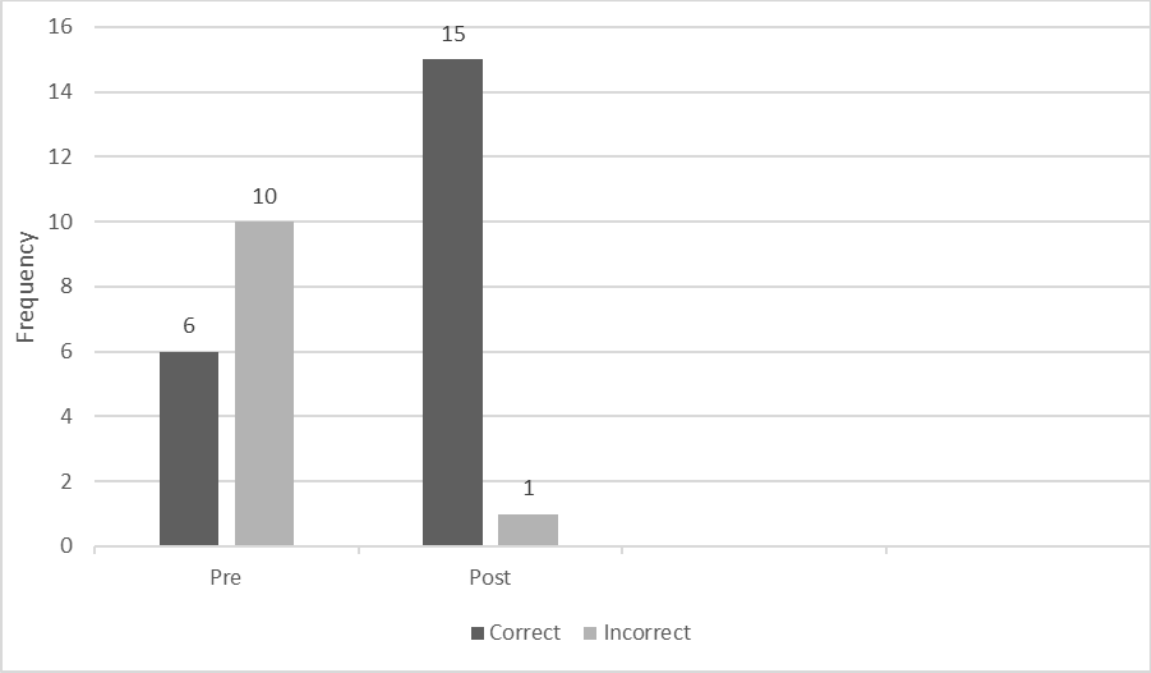
When Do You Begin Looking for Signs of Withdrawal?



The next question is a follow-up to the previous question that stated that the baby starts having episodes of the following: inconsolable crying for more the 5 minutes, not eating well, sleeping less than 2 hours, temperature 99, and loose stools. During feed time, the baby has a diaper change and is contained with a swaddle; they calm down. *What is your score?* A copy of the Finnegan Scoring Tool was provided. (See Appendix B). The participants were given a choice of three possible scores, and on the pre-questionnaire, only 29% *(n=6)* answered correctly, on the post-questionnaire they scored 71% (*n*=15) correctly (Figure 4).

Figure 4

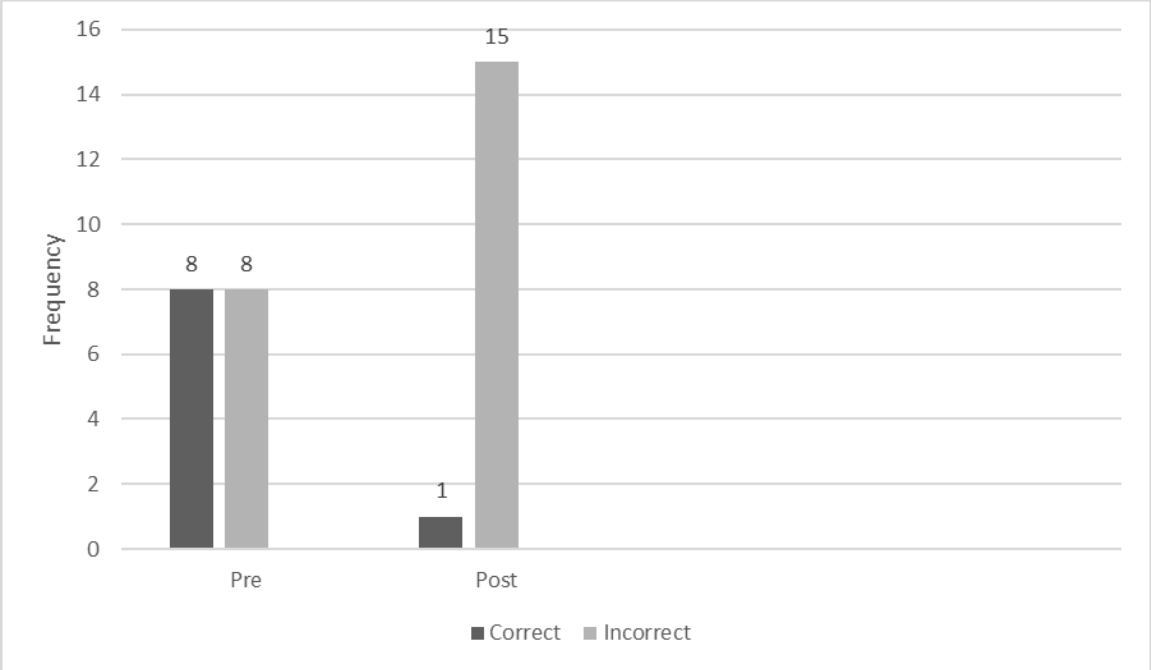
What is Your NAS Score?



The next step is to reevaluate the baby at the next feeding time. At the next feed time, the question asked, *the baby will not suck adequately to eat, is stiff, slept less than 2 hours, has a temperature of 100, loose stools, and you notice a slight tremor undisturbed. What is your NAS score?* Using the form provided, the nurses evaluate the symptoms to determine the score. The nurses determined on the pre-questionnaire the correct score of 89% *(n*= 8), but oddly they only picked the correct score 11% (*n=1) on* the post-questionnaire. This low score is an odd development because the educational presentation should have assisted the nurses in figuring out the correct score. This low score may indicate that the nurses need further education on these symptoms and the correct way to score.

Figure 5

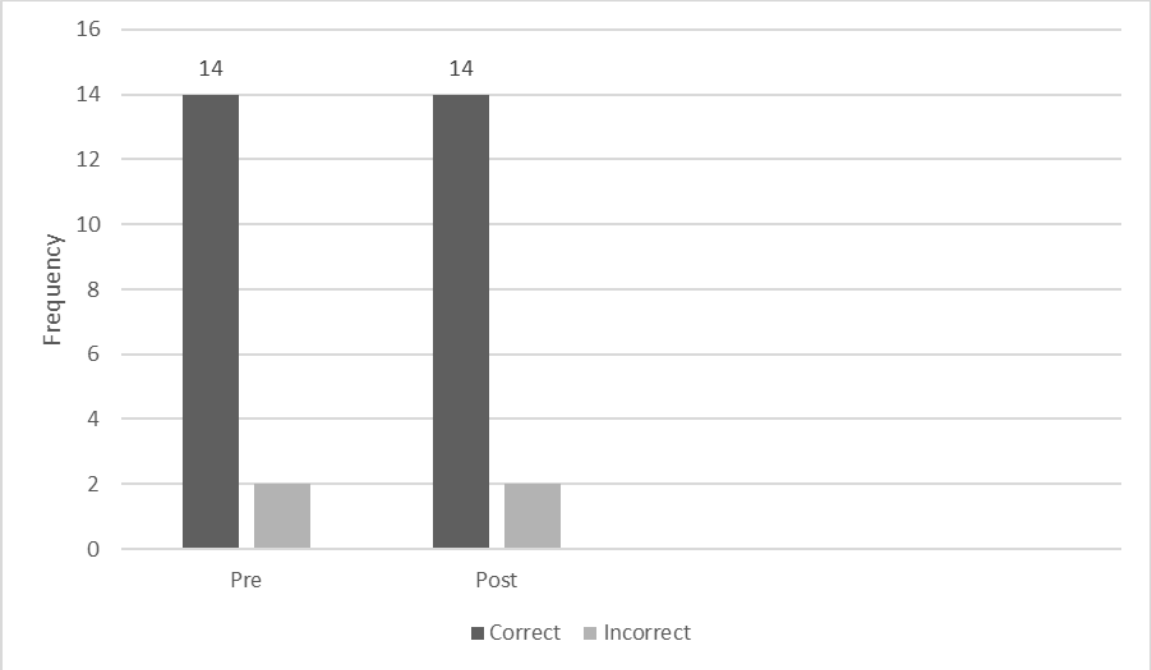
What is Your NAS Score?



The next question asks *what the goal is when treating a NAS infant*. Ironically, the nurses score the same pre-and post- questionnaire. The score was 50% on each of the surveys. The multiple-choice question and the correct answer were *all the above*; all the answers were correct; the goal of treatment is to relieve discomfort and pain, allow the infant to interact appropriately, eat and retain enough calories to grow, and prevent potential harmful events from happening (See Figure 6).

Figure 6

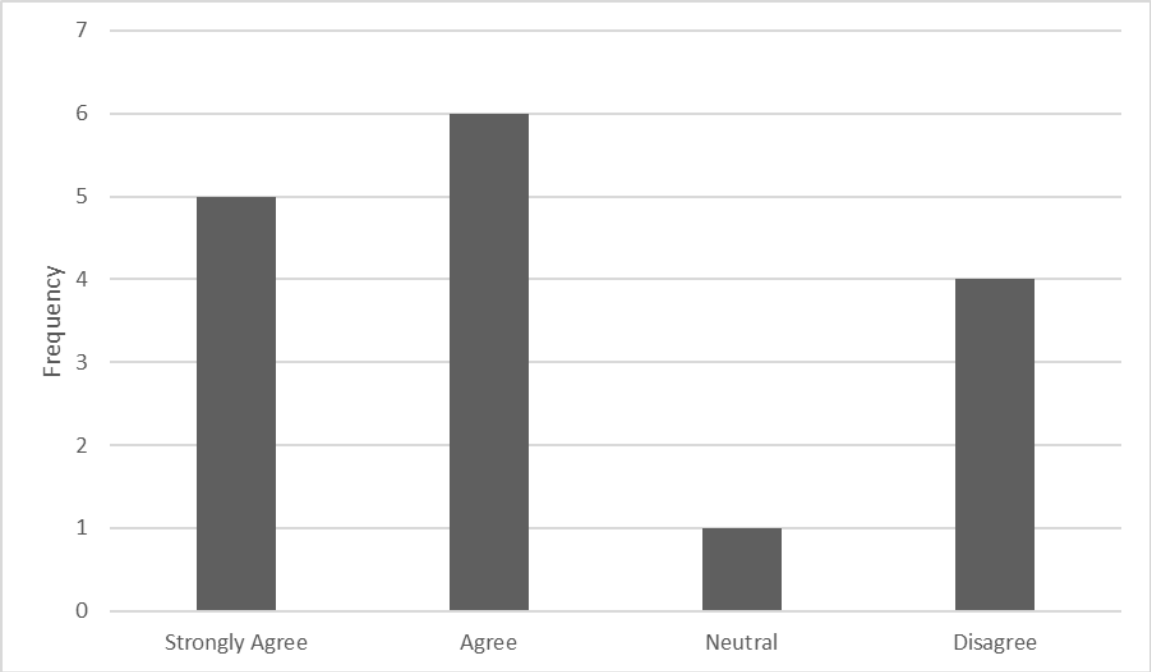
The Goal When Treating a NAS Infant is:



The last two questions that need to be addressed use a 5-point Likert scale, and they ask if the participants feel they are adequately trained to use the Modified Finnegan NAS tool and if the educational presentation was helpful. The first question *I feel I have been adequately trained in the use of the Modified Finnegan NAS tool.* On the pre-questionnaire, the nurses responded with strongly agree 31% (*n*=5), agree 38% (*n*=6), and disagree 25%(*n*=4), *M*= 3.75, and the *SD* was 1.183 (See Figure 7). This question justified the need for further education for the staff.

Figure 7

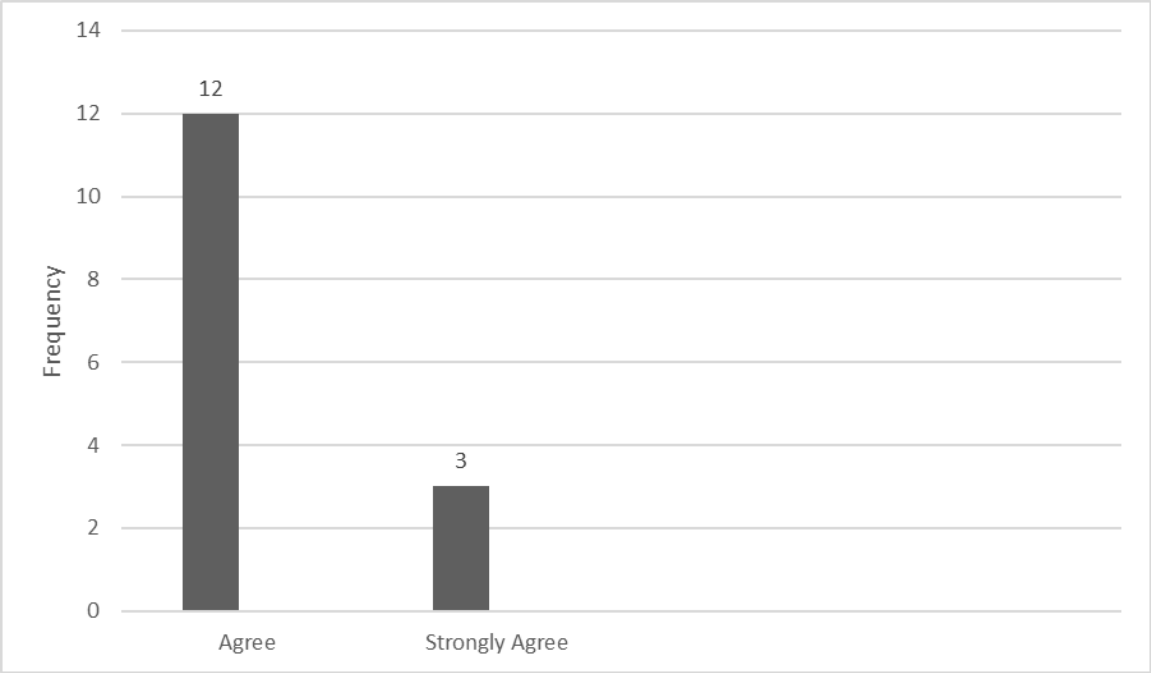
I Feel That I Have Been Adequately Trained in the Use of the Modified Finnegan NAS Tool



The next question asked if the educational presentation was helpful in the care of these neonates. This question was only asked on the post-questionnaire to evaluate the effectiveness of the educational presentation. The question asked was *this presentation on the use of the Finnegan Neonatal Abstinence scoring tool was helpful in my care of NAS infants.* The participants agreed, 38% (*n*=12) and 10% (*n*=3) strongly agreed *(M* =4.2 *SD* = 0.414) that this presentation was helpful. (Figure 8)

Figure 8

This Presentation on the Use of the Finnegan Neonatal Abstinence Scoring Tool was Helpful in my Care of a NAS Infant



Summary

The results of this pre-and post-questionnaire showed that with a good educational program the nursing staff will improve their accuracy and knowledge in the care of NAS infants. This dynamic group of nurses finished the post-questionnaire and correctly answered questions on the symptoms of withdrawal, and they indicated that they *feel I need more education on the FNAS tool*, 55% (*n=7)* of the nurses agreed that they needed more education on the *M*=3.54 and an *SD* of 0.877 on the pre-questionnaire. On the post-questionnaire, they were asked if *this presentation on the use of the Finnegan Neonatal Abstinence scoring tool was helpful in my care of NAS infants*. The participants agreed 38% (*n*=12) and 10% (*n*=3) strongly agreed *(M*=4.2 *SD*=0.414) that this presentation was helpful.

Conclusion

Neonatal Abstinence Scoring takes training and understanding of the symptoms associated with withdrawal. The training involved should include continued education to increase the nursing staff's accuracy and knowledge using the tool. According to Gomez-Pomar et al. (2017), the nurses' competency for accuracy in scoring is a factor that cannot be thoroughly analyzed because multiple levels of severity need to be educated and understood. The participants were asked when symptoms usually appear in NAS infants. The scores on the pre-questionnaire were 38% (n=8) correct, and on the postquestionnaire, the correct score was 65% (n=15).

This study aimed to determine if an educational intervention for registered nurses improves comprehension and accuracy of scoring the neonatal abstinence syndrome tool on newborns. Timpson et al. (2018) completed a study at UMASS and found that pretraining, training, and post-training assessment would improve the use of the scoring tool from 18.8% pre-training on target scoring to 34.7%. In the study completed there was an increase in scoring on the scenarios and the participants stated with their scores that the presentation was helpful in their care of NAS infants with a score of 38% (n=12).

Discussion

An educational intervention to educate the nursing staff on the use of the NAS tool was given after the participants completed a pre-questionnaire. The results of this pre-questionnaire were compared to the post questionnaire. The two questionnaires were compared and there was a positive correlation in the accuracy on the post-questionnaire.

A study conducted by Romisher et al. (2018) at a regional neonatal nursing conference in New England found that 27.8% of participants reported not having 48

adequate knowledge of the symptoms of NAS and the use of the NAS tool. When a similar question was asked in this study, 53.8% of participants stated they needed more education on the FNAS stool.

The goal of this teaching is to help the participants recognize the signs and symptoms of withdrawal. Romisher et al. (2018) performed a survey in New England and the participants identified the symptoms 90% of the time. In this survey, the participants recognized the symptoms at least 87%.

Another similar question was asked in the two surveys. Both surveys asked if the withdrawing neonate should be cared for in the NICU. The New England survey found that only 1.9% strongly agreed, and 29.6% agreed that neonates should be in the NICU; in this study, 38% agreed, and 6% strongly agreed.

When asked if they felt like they had enough knowledge about NAS to provide adequate care, the New England study participants agreed at 44.4% and strongly agreed at 46.3%. The study found that only 37.5% agreed, and 31.3% strongly agreed. This information indicates more educated.

Implications

Better accuracy and more knowledge about NAS mean the nurse has the ability to help the parents contain some of the symptoms of withdrawal. When asked, participants in both studies understood that nonpharmacological interventions such as swaddling, turning down the lights, and holding the infant could decrease the risk of more severe withdrawal symptoms. The nurse has the knowledge to teach the parents how to take better care of their neonate during this transition time.

Limitations

One limitation of this study includes the small and limited sample size used. Only 16 of the 150 nurses in the department responded to and participated in this study. If the sample size were more extensive and more gender diverse, there were only female participants, the results could have changed some. Another limitation is that the nurses in this department receive education on this subject yearly; so many had this education last year, and their scoring was more accurate than the newer nurses who only had limited exposure to NAS neonates. Another limitation was the limited time to complete this study due to the weather. During this study, we had winter weather, and it created a limited time to get the education completed and the information out about the pre and post questionnaire and how to complete them.

Recommendations for Future Research

Recommendations for the future of this study would be to broaden the scoring tools used. There are many tools that are used for withdrawing neonates that may be more helpful or easier to use to quickly diagnose withdrawal. Another recommendation would be to include a pre-assessment questionnaire for new hires prior to any education, then train them on tools specifically used by the institution. It would also be recommended to include eat, sleep, and console in the results with the scoring; this is another tool and care tool being re-introduced into the NAS world.

Conclusion

This study concludes that proper educational intervention on the use and scoring of the NAS tool for infants addicted to opioids improves comprehension and accuracy of scoring the NAS by registered nurses. A pre-questionnaire to assess the baseline of the

education on withdrawing neonates gave the primary investigator an idea of the education 50 needed to improve NAS scoring. The next step was an educational presentation that re-in force the withdrawal symptoms and how to use the NAS scoring tool. The last step was to have the participants complete a post-questionnaire to assess for an increase in comprehension and accuracy of scoring.

The scores on the post-questionnaire improved on all the questions asked on both the pre-and post- questionnaire. This improvement positively correlates toward a better comprehension of the NAS scoring tool.

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Appendix A

Institutional Review Board Approval Letter

Appendix A: Institutional Review Board Approval Letter

ARKANSAS TECH UNIVERSITY

OFFICE OF RESEARCH AND SPONSORED PROGRAMS

1509 North Boulder Avenue
Administration, Room 207
Russellville, AR 72801

479-880-4327
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February 2, 2022

To Whom It May Concern:

The Arkansas Tech University Institutional Review Board has approved the IRB application for Michelle Porter's proposed research, entitled "Educational Interventions for Registered Nurses to Improve Comprehension and Accuracy of the Neonatal Abstinence Syndrome Tool in Newborns: A Quantitative Study." The Institutional Review Board used an expedited review procedure under 45 CFR 46.110 (7).

Please note that in the event that any of the parameters of the study change, the researcher may be required to submit an amended application.

Please proceed with your research. We wish you success with this endeavor.

Sincerely,

Bryan D. Rank

Bryan Rank, Ph.D.
Institutional Review Board
Arkansas Tech University

Appendix B

Neonatal Abstinence Scoring System

Appendix B: Neonatal Abstinence Scoring System

NEONATAL ABSTINENCE SCORING SYSTEM

Modified Finnegan Neonatal Abstinence Score Sheet[1]

System	Signs and Symptoms	Score	AM	PM	Comments
Central Nervous System Disturbances	Excessive high-pitched (or other) cry < 5 mins	2			
	Continuous high-pitched (or other) cry > 5 mins	3			
	Sleeps < 1 hour after feeding	3			
	Sleeps < 2 hours after feeding	2			
	Sleeps < 3 hours after feeding	1			
	Hyperactive Moro reflex	2			
	Markedly hyperactive Moro reflex	3			
	Mild tremors when disturbed	1			
	Moderate-severe tremors when disturbed	2			
	Mild tremors when undisturbed	3			
	Moderate-severe tremors when undisturbed	4			
	Increased muscle tone	1			
	Excoriation (chin, knees, elbow, toes, nose)	1			
	Myoclonic jerks (twitching/jerking of limbs)	3			
	Generalised convulsions	5			
Metabolic/ Vasomotor/ Respiratory Disturbances	Sweating	1			
	Hyperthermia 37.2-38.3C	1			
	Hyperthermia > 38.4C	2			
	Frequent yawning (> 3-4 times/ scoring interval)	1			
	Mottling	1			
	Nasal stuffiness	1			
	Sneezing (> 3-4 times/scoring interval)	1			
	Nasal flaring	2			
	Respiratory rate > 60/min	1			
	Respiratory rate > 60/min with retractions	2			
Gastrointestinal 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				
	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.