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Evaluation of a Neonatal Abstinence Syndrome Training Program on Correct Use of the Finnegan Scoring Tool and Nurse Confidence

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By

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Table of Contents

Abstract 5

Problem Description 6

Available Knowledge 9

Theory and Framework 12

Theory 12

Framework 14

Specific Aim 14

Methods 15

Context 15

Intervention 15

Measures 18

Demographic Questionnaire 18

Self-Confidence Questionnaire 18

FST 18

Student Satisfaction and Self-Confidence in Learning Questionnaire 19

Analysis 19

Ethical Considerations 20

Results 20

Accuracy 20

Confidence 21

Process Evaluation 22

Discussion 22

Summary 22

Limitations 23

Conclusions 24

References 26

Appendices 31

Appendix A: Diagram of Literature Search 31

Appendix B: Levels of Evidence Synthesis Table 32

Appendix C: Literature Review Analysis 33

Appendix D: Literature Review Synthesis 40

Appendix E: Lewin's Theory of Change 44

Appendix F: PDSA Cycle for Process Improvement Change 45

Appendix G: FST Pilot Project Timeline 46

Appendix H: Recruitment Flyer 47

Appendix I: Institutional Review Board Approvals 48

Appendix J: Recruitment Email 51

Appendix K: Implied Consent 52

Appendix L: Demographic Questionnaire 53

Appendix M: Self-Confidence Questionnaire 54

Appendix N: Finnegan Scoring Tool 55

Appendix O: Student Satisfaction and Self-Confidence in Learning Questionnaire. 57

Appendix P: Participant Demographics 58

Appendix Q: Reliability Data 59

Appendix R: Total Finnegan Scores 60

Appendix S: Individual FST Symptom Analysis 61

Appendix T: Confidence Results 63

Abstract

Maternal substance abuse during pregnancy is a growing perinatal problem. Drug-exposed infants are at risk of Neonatal Abstinence Syndrome (NAS) as a result of withdrawal symptoms. The Finnegan Scoring Tool (FST) can be used to identify infants showing withdrawal symptoms but must be used correctly. Educational programs that demonstrate correct use of the FST have been shown to improve accuracy and nurse confidence. A voluntary, convenience sample of nurses from three units participated in a project to evaluate the impact of a NAS training program on correct use of the FST and nurse confidence. Using a pre/post-test design, participants improved accuracy by 29.4% at post-training. The accuracy goal of at least 90% inter-observer reliability for NAS scoring was achieved post-training, but the benchmark was not retained at follow-up. However, identification of correct total NAS score did not always correlate to accurate symptom identification. There was a statistically significant increase in confidence from pre-training to post-training. Participants reported positive project feedback and need for additional training. Nurses need advanced NAS training in order to improve symptom detection that will in turn impact patient outcomes.

Keywords: neonatal abstinence syndrome, Finnegan Scoring Tool, confidence

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Neonatal Abstinence Syndrome (NAS) describes withdrawal symptoms experienced by the newborn due to maternal substance use (Sublett, 2013). These newborns may have hypersensitivity of the central nervous system (CNS) with high-pitch crying, increased muscle tone, tremors, and convulsions. Other symptoms may include poor feeding, tachypnea, excessive sucking, nasal congestion, vomiting and frequent yawning. Over 60-90% of newborns exposed to opiates during pregnancy will have symptoms of withdrawal after birth (Hahn et al., 2016).

In perinatal medicine, maternal substance abuse is one of the most frequently missed conditions. Most screening of maternal substance abuse during pregnancy is based on the woman's self-report (Murphy-Oikonen, Montelpare, Southon, Bertoldo & Persichino, 2010). This reporting is potentially underestimated since women may be afraid to disclose substance abuse. Thus, the exact number of women who abuse substances during pregnancy is difficult to determine. Nurses must play a key role in screening and identification of infants at risk. Ensuring that they use scoring tools accurately and confidently can impact patient outcomes.

Problem Description

The incidence of NAS has risen by 300% over the past 30 years (Sublett, 2013). There is one newborn infant born every half hour who is diagnosed with NAS in the United States (Timpson, Killoran, Maranda, Picarillo & Bloch-Salisbury, 2018). Approximately 4.4% of pregnant women in the United States will abuse at least one substance during pregnancy, especially those between the ages of 15 and 17 (McQueen, Murphy-Oikonen & Desaulniers, 2015). There were 15 cases of NAS for every 1000 hospital births reported for Kentucky in 2013, the third highest ranking for registered states in the country (Ko et al., 2016).

Many of the known negative effects of maternal drug use on neonates include prematurity, birth defects, low birth weight, sepsis, perinatal hypoxia, asphyxia, respiratory depression and placental hemorrhage (McQueen et al., 2015; Murphy-Oikonen et al., 2010). These infants also have behavior, cognition and attention deficits later in life (McQueen et al., 2015). Infants with NAS may also experience poor feeding, which may lead to poor weight gain and failure to thrive (D'Apolito, 2014).

Family disruption may occur if maternal substance use is not managed during and after pregnancy (Shook, 2018). Maternal-infant bonding is interrupted if infants require additional nursery observation or admission to the neonatal intensive care unit. Keeping infants with their mothers in postpartum rooms may be limited due to design of hospital units and staff availability, thus separating families (MacMullen, Dulski & Blobaum, 2014).

In 2009, the estimated total hospitalization cost for these infants was over $720 million (D'Apolito, 2014). Infants with the NAS have an average length of stay of 17 days and 23 days for those needing treatment (McQueen & Murphy-Oikonen, 2016). Improving the quality of care provided to infants of mothers with substance abuse is an important step for organizations to take when dealing with the drug epidemic in the country. The World Health Organization (WHO) recommends healthcare providers have established protocols for identifying and evaluating care for infants exposed to substances that includes both pharmacologic and non-pharmacologic methods (WHO, 2014).

Substance abuse is a health issue that touches people throughout communities. The goal of healthcare organizations should be for care teams to collaborate in order to provide the highest quality of evidence-based care for the good of the patient (White, 2016). Early identification and

treatment for optimal patient outcomes is a consistent goal of the Institute of Medicine and other leading agencies (The National Academies of Sciences, Engineering, and Medicine, 2018).

The Finnegan Scoring Tool (FST) is a standardized tool used to identify infants with NAS. This instrument is comprised of 21 withdrawal symptoms associated with NAS and is the most commonly used NAS tool in the United States (Clark & Rohan, 2015). Each symptom is scored from one to five based on the severity of the symptom. Infants who score an eight or higher are showing withdrawal symptoms and are often recommended for pharmacologic therapy. Infants scoring less than eight receive non-pharmacologic treatments such as dim, quiet environments, swaddling and frequent feedings (D'Apolito, 2014). These treatments may be delivered by the mother to encourage maternal-infant bonding or by nursing staff. Though other NAS scoring tools such as the Lipsitz Score and Neonatal Narcotic Withdrawal Index exist, the FST is the gold standard tool for assessing NAS (Bagley, Wachman, Holland and Brogly, 2014).

Nurses must use the FST correctly to achieve the best patient outcomes. Establishing an educational program that identifies the scoring criteria of all 21 NAS symptoms, along with interrater reliability testing, can improve the ability of nurses to consistently score the same infant, at the same time, with the same NAS score. When the score is accurate, at-risk neonates are identified as quickly as possible for appropriate care. This may in turn improve patient outcomes and decrease healthcare costs (Clark & Rohan, 2015). In contrast, inaccurate assessment by providers of substance-exposed infants negatively impacts care of these compromised newborns (Murphy-Oikonen et al., 2010). Treatment may be delayed if symptoms of withdrawal are not identified. Infants may also inadvertently receive medications that could be harmful.

The American Society of Addiction Medicine (2015) recommends all providers be alert for signs and symptoms of opioid use disorder. Thus, the American Academy of Pediatrics recommends testing of infant urine, meconium and sometimes cord tissue sampling in order to help determine neonatal drug exposure (Sublett, 2013). Timpson et al. (2018) also report that infants needing pharmacologic therapy may have delayed treatment if nurses do not accurately score the tool or receive medically unnecessary pharmacologic treatment related to over-scoring. Since screening, diagnosing and treating newborns with NAS may not be initiated due to lack of maternal report and standardized screening (Murphy-Oikonen et al., 2010), nursing participation is vital. To improve patient outcomes, this project focused on improving accuracy of FST use and nursing confidence in using the tool.

Available Knowledge

A review of the literature was performed with a focus on NAS assessment with the FST in hospital settings and NAS training programs with interrater reliability of the FST. The purpose was to examine best practices for translation to this project. Three main databases were used to find applicable studies and included the Cumulative Index of Nursing and Allied Health Literature (CINAHL), PubMed, and the Cochrane Collaboration. Keywords used in an initial search of these databases included neonatal abstinence syndrome, reliability, scores, tools, and Finnegan. Using NAS as a key search term along with Finnegan and scoring generated 41 articles in PubMed. A CINAHL literature search with key terms of NAS, reliability, scores, and tools found up to 17 articles. Five studies were selected that addressed NAS regarding infant assessment and treatment, along with nurse training on use of the FST (Appendix A).

Based on criteria by Melnyk and Fineout-Overholt (2015), three articles were Level VI evidence as descriptive and evidence-based practice implementation projects (Lucas & Knobel,

2012; Maguire et al., 2013; McQueen et al., 2015; Timpson et al., 2018) and one was Level IV evidence as a cohort study (Murphy-Oikonen et al., 2010). There were no randomized controlled trials or controlled trials without randomization found in the literature search regarding NAS interrater reliability testing programs (Appendix B). Evidence quality was again evaluated using the Melnyk Rapid Critical Appraisal Tool.

All five of the studies selected took place in the United States except for one performed in Ontario, Canada (McQueen et al., 2015). All articles used the FST as the guide for NAS scoring for newborns (Appendix C). Participants in all studies who gave NAS scores were registered nurses. Two studies involved neonatal nurses as the study participants (Lucas & Knobel, 2012; Timpson et al., 2018). The other three articles involved infants admitted to the NICU with a diagnosis of NAS (Maguire, Cline & Parnell, 2013), infants with NAS and documented maternal substance use (McQueen et al., 2015) and infants who received at least one NAS score based on the FST (Murphy-Oikonen et al., 2010).

There were many similarities between the five reviewed studies. All articles included NAS training for neonatal nurses on how to use the FST that support scoring training. The setting for three of the studies took place in regional neonatal intensive care units (Lucas & Knobel, 2012; Maguire et al., 2013; Murphy-Oikonen et al., 2010). The other two studies occurred in neonatal intensive care units (NICU) and newborn nurseries (McQueen et al., 2015; Timpson et al., 2018). All studies described NAS similarly as withdrawal symptoms experienced by the newborn in response to exposure to maternal substance use. Maternal substance abuse involved illicit and drugs exposure in utero for all studies.

NAS symptoms were scored with the same FST for all reviewed studies. Names varied for what the tool was called: FNAST (Finnegan Neonatal Abstinence Scoring Tool) in Lucas et

al. (2012); Modified Finnegan Neonatal Abstinence Score (M-FNAS) in Maguire et al. (2013); Modified Finnegan Scoring Tool (MFST) in McQueen et al. (2010); Finnegan Scoring Tool in Murphy-Oikonen et al. (2010); and Finnegan Neonatal Abstinence Scoring System (Finnegan Scale) in Timpson et al. (2018). A minimum interrater reliability score goal of at least 90% was established for two studies (Lucas & Knobel, 2012; Maguire et al., 2013), while Timpson et al. (2018) determined interrater reliability acceptability if nurses' NAS scores were plus or minus one point of each other. McQueen et al. (2015) and Murphy-Oikonen et al. (2010) did not include an acceptable interrater reliability percentage as part of their studies. For purposes of this project, FST will describe the tool and 90% reliability will establish minimum reliability.

Nurse confidence and buy-in improved post-training with the Neo Advances program (Lucas & Knobel, 2012; Timpson et al., 2018) and NAS scoring accuracy and interrater reliability improved for three studies post-training (Lucas & Knobel, 2012; Maguire et al., 2013; Timpson et al., 2018). Timpson et al. (2018) determined that the NAS training that included videos from Neo Advances helped to decrease overrating severity of NAS symptoms. Accuracy of scoring is important when treatment is based on the scoring system.

Improved detection of maternal substance abuse helps to determine and improve NAS assessment and treatment (McQueen et al., 2015; Murphy-Oikonen et al., 2010). This also helps to decrease length of stay for infants with appropriate NAS assessment and scoring (Lucas & Knobel, 2012; Murphy-Oikonen et al., 2010). Inaccurate maternal self-report of substance may delay appropriate NAS treatment, so improved prenatal screening for substance detection is important (Murphy-Oikonen et al., 2010).

Limitations of one study included low NAS population (Lucas & Knobel, 2012) and high NAS prevalence in another (McQueen et al., 2015). Lucas and Knobel (2012) stated study

weaknesses also included not being able to determine clinical outcomes like length of stay or consistency of nurse scoring past one week of training. Maguire et al. (2013) reported not being able to use their short form of the FST for infants with rapidly increasing withdrawal symptoms due to inadequacy of their tool. Effect size for Lucas and Knobel (2012) was large, yet McQueen et al., (2015) and Timpson et al. (2018) had small effect sizes for their interventions despite statistically significant outcomes. Providers should determine whether there is sufficient clinical significance for NAS interventions when planning programs and training (Appendix D).

In summary, improved detection of maternal substance abuse and correct use of the FST helps to identify at-risk newborns (Maguire et al., 2013; McQueen et al., 2015; Murphy-Oikonen et al., 2010). Training on correct use of the FST can help improve accuracy for NAS scoring and decrease unnecessary pharmacologic treatment (Lucas & Knobel, 2012; Timpson et al., 2018). Lastly, education on NAS helps promote best practice adherence (Lucas & Knobel, 2012).

Theory and Framework

Theory

Kurt Lewin's change theory provided context to help influence and make a change process successful in this project (Doolin, Quinn, Bryant, Lyons & Kleinpell, 2011). Lewin's three stages include unfreezing, change/transition and freezing/re-freezing (Appendix E). They can be used to successfully implement strategies that will support a practice change of incorporating a new NAS educational program for scoring training with the FST for nurses caring for infants with NAS.

During unfreezing, information was gathered, a problem was identified which required a change, and people in the agency were made aware of the need for change. A list of pros and cons related to the proposed change occurred prior to any change action starting, including

identification of potential resistance to change. Lewin and Grabbe (1945) state that people need to feel change is needed based on driving and restraining forces. Driving forces inspire change, while restraining forces discourage the change process. McGarry, Cashin and Fowler (2012) state that often more than one type of intervention is needed in order to help people see the need for a change in practice.

Unfreezing is a time for the organization's leaders to make a case for the establishment of the NAS training program. There are potential restraining forces with this change. Neonatal nurses may feel overwhelmed with having to add another assessment component to their NAS assessments. Lewin and Grabbe (1945) warn that involuntary participation may lead to hostility for the new change. There also would be a cost to the organization for time the nurses would spend either away from work or during normal work hours in order to attend the NAS training.

These restraining forces would need to be outweighed by the driving forces for a new NAS training program. Driving forces would include helping nurses see the importance of improving detection and assessment of infants with NAS in order to improve neonatal outcomes through appropriate interventions. Improving nurse confidence in using the FST could be another facilitating factor.

The second phase of Lewin's change theory is moving or transition and a time to form a plan with goals and objectives (Doolin et al., 2011; Lewin & Grabbe, 1945). This phase included planning the time for change to occur along with methods to evaluate and modify the change after implementation. Supportive and resistive areas were identified in order to develop strategies, which would be supportive of the change and deal with change opposition (McGarry et al., 2012). This was a time for trial and error for the change process (Lewin & Grabbe, 1045). Knowledge gained from this pilot project will help the organization prepare for future

educational NAS training programs. Wells, Manuel and Cunning (2011) assert that nurses involved with the change should be included in decision-making.

The third phase involves freezing/re-freezing as a time for equilibrium to be re-established with the new change, thus creating a new norm (Lewin & Grabbe, 1945). During this phase, an agency incorporates new policies and procedures that help sustain the change (McGarry et al., 2012). Freezing/re-freezing would occur after the NAS training program has been implemented and evaluated. The new norm of eventually having all neonatal nurses attend the NAS training program would be established and hopefully maintained.

Framework

This project was also guided by the Plan-Do-Study-Act (PDSA) cycle for process improvement change (Appendix F). The Institute for Healthcare Improvement (IHI) (2017) describes the PDSA as beneficial tool to use when supporting a test of change. The cycle begins by creating a plan that will test a change (Plan). Next, the test is performed (Do). Data from the test is then observed, analyzed and evaluated (Study) in order to decide if any changes need to be made before the cycle is completed again (Act). Timpson et al. (2018) also used the PDSA cycle as part of their study strategy.

The Plan step included preparing for the test and how data would be collected (IHI, 2017). This involved creating a timeline for pilot project preparation and training materials. (Appendix G). The Do step involved carrying out a pilot test. The Study step consisted of analyzing and comparing the results to study predictions. The Act step involved learning from the test and planning for the next PDSA cycle.

Specific Aim

To review, nurses play a key role in screening, identification and referral for NAS but may need additional training on use of the FST to increase confidence. The purpose of this project was to evaluate the impact of a NAS educational training program on the accuracy and reliability of NAS scoring by neonatal nurses when using the FST, as well as the impact of training on nurse confidence when using the FST. Results from this project will help guide future educational plans for NAS training at the agency and help answer the following two questions; 1) Does NAS and FST training improve scoring accuracy? and 2) Does NAS and FST training increase scoring confidence?

Methods

Context

The pilot project was conducted at a 391-bed tertiary medical center located in the Southeast region of the United States. This hospital has maintained Magnet status for nursing excellence since 2005 with a specialty in comprehensive cardiac, orthopedic, cancer, neuroscience and maternity services. The agency employs approximately 63 mother-baby nurses, 70 neonatal intensive care nurses and 10 pediatric nurses who may provide care to infants with NAS. In 2017 there were approximately 3298 infant deliveries at this agency, and 57.3 infants were diagnosed with NAS out of every 1000 births. While nurses receive training on using the FST as part of their unit orientation education, currently there is not a program for assessing provider accuracy and confidence when using the NAS tool over time.

Intervention

Using the PDSA framework, the DNP project leader recruited 17 voluntary participants by use of a flyer on the mother-baby, pediatric, and neonatal intensive care units at a tertiary hospital (Appendix H). Institutional Review Board approval was obtained from both the agency

and university (Appendix I). An email was distributed with the flyer to all nurses who meet the inclusion criteria four weeks prior to the training session (Appendix J). A follow-up email reminder was sent to those who volunteered to participate one week prior to their training session. Implied consent was obtained from all 17 participants prior to the training sessions (Appendix K). The agency did compensate the participants their individual, hourly rate for time spent in the training sessions through their unit education budgets. See Table 1 for approximate pilot project expenses.

Table 1

NAS Pilot Project Expenses

Expenses	Single Cost	Total Cost
Neo Advances DVD/Manual (n=1)	$120	$120
RN salary rate (n=17 nurses)	$32.66/hour	$81.65/nurse or $555.22 total
Printing (n= 136 sheets)	$0.10/sheet	$13.60
Educator salary (n= 1 nurse)	$32.66/hour	$97.98/3 hours training
Training materials	$45.00	$45

Neo Advances' (n.d.) Inter-Observer Reliability Training program, created in 1993 by Drs. D'Apolito and Finnegan, helps train nurses to accurately assess withdrawal symptoms in infants exposed to opiates during pregnancy. D'Apolito and Finnegan (2010) include two DVD videos of Dr. D'Apolito demonstrating an examination of an infant for NAS that can be used for pre-training and post-training assessment. Item definitions, exam techniques, exam scoring instructions and comfort measure tips are included in the manual. D'Apolito (2014) states that the program was created specifically to increase reliability of NAS scoring when using the FST. Scores should be 90% or more in agreement with the established expert video score in order to establish inter-observer reliability (D'Apolito, 2014). Nurses should be able to give the same score to the same infant at the same assessment time. Implementing improved NAS training that

includes videos from the Neo Advances Inter- Observer Reliability program has shown improvement in neonatal nurses being able to have increased confidence using the FST as well as improvement in scoring accuracy and reliability. Thus, this training was selected and used for this pilot project.

Participants each received a stapled packet for all collection point with needed papers. The pre-test packet included the Demographic Questionnaire (Appendix L), Self-Confidence Questionnaire (Appendix M) and FST (Appendix N). The post-test packet included a FST and Self-Confidence Questionnaire. The follow up packet included the FST and Self-Confidence Questionnaire. Participants listed their mother's date of birth on their demographic and confidence sheets as identifiers. There were two locked boxes labeled pre-test and post-test in the training room for participants to place their own papers into prior to leaving the training and at follow-up.

The training session began by having participants complete a Demographic Questionnaire and a Self-Confidence Questionnaire. Nurses then simultaneously watched a video of an infant being assessed for NAS at the beginning of the training session. Participants used the FST to document a NAS score. Educational training with PowerPoint on NAS care and correct use of the FST followed the pre-training video. Once the educational training was complete, nurses watched the same video of an infant being assessed for NAS and used a FST to give a NAS score. Confidence in assessing infants with NAS and use of the FST was evaluated with the Self-Confidence Questionnaire. Nurses also completed the Student Satisfaction and Self-Confidence in Learning Questionnaire (Appendix O) to evaluate their attitudes about the educational session once the training was complete.

To measure if participants were still able to retain accuracy and confidence from the training session, nurses watched a follow-up video two to four weeks after the educational training session. Participants again completed another Self-Confidence Questionnaire and FST. The description of each instrument is discussed in the next section.

Measures

Demographic Questionnaire. Demographic data for nurses participating in the project included age, primary hospital unit, total years of nursing practice, gender, highest level of completed education and any national nursing certifications. Nurses completed this form as the first pre-training activity (Appendix L).

Self-Confidence Questionnaire. Participants answered a questionnaire with Likert-scale scoring to assess their level of self-confidence with using the FST for scoring NAS at the following times: pre- and post-training, as well as at the follow up session. Participants identified their level of self-confidence with a Likert scale of 0= no confidence, 1= slight confidence, 2= moderate confidence and 3= high confidence. Higher scores indicate higher levels of perceived self-confidence (Appendix M).

FST. Finnegan, Connaughton, Kron and Emich (1975) developed the FST to help provide uniform criteria for assessing withdrawal symptoms and help guide treatment protocols for infants with NAS. Each of the 21 NAS symptoms are scored from one to five based on symptom severity (D'Apolito, 2014). There are three main categories: CNS, metabolic/vasomotor/respiratory systems, and gastrointestinal (GI) system. Infants receive higher scores as withdrawal symptoms increase (Appendix N).

Neo Advances (n.d.) lists the FST as part of a program available for purchase. Permission to use the training videos is included with purchase. Permission to publish the FST included with

the Neo Advances program has been granted by the author. Bagley et al. (2014) report a mean interrater reliability coefficient of 0.82 (0.75-0.96) for the original FST. Instruments with a Cronbach's alpha of 0.8 or greater demonstrate reliability (Brewer and Alexandrov, 2015).

Student Satisfaction and Self-Confidence in Learning Questionnaire. The National League of Nursing (2018) created the Student Satisfaction and Self-Confidence in Learning Questionnaire to evaluate participant perception of simulation training. This questionnaire used a Likert scale of 1= Strongly Disagree with the statement; 2= Disagree with the statement; 3= Undecided; 4= Agree with the statement; 5= Strongly Agree with the statement. Scores increase with reported higher levels of satisfaction and self-confidence with current learning. This tool has a Cronbach's alpha of 0.94 for satisfaction and 0.87 for self-confidence (Appendix O). Use of the tool in doctoral projects does not require permission to use unless work is submitted for publication. This tool provided participants an opportunity to evaluate the training program at the end of educational session.

Analysis

Data results were manually entered into a Statistical Package for the Social Sciences version 24 program by the principle investigator on a password-protected computer in order to analyze population demographics, FST accuracy, and changes in confidence. The tests and questionnaires were grouped and analyzed based on three testing points: 1) pre-training; 2) post-training; and 3) follow-up. All pre-test documents were analyzed together as the first collection point. The post-training documents were calculated as the second collection point. The documents completed two to four weeks post-training were calculated as the third collection point. The Demographic Questionnaires were completed during the first data collection point at the beginning of the training session. The percentage of correct responses in agreement with the

established expert NAS score on the FST for both videos was measured for each participant in order to calculate inter-observer reliability. Participant responses on the Student Satisfaction and Self-Confidence in Learning Questionnaire were analyzed together. Lastly, comments made by participants were analyzed for themes by the project team.

Ethical Considerations

Due to a small sample size, the primary investigator incidentally was able to identify two participants based on national certification and unit worked from the Demographic Questionnaires, which could lead to bias. However, the other members of the project team were able to maintain anonymity for all participants, and participation was voluntary. The author declares no conflict of interest for this project.

Results

A volunteer, convenience sample of 17 nurses participated, representing the following units: Mother-Baby (n=11); NICU (n=5); and Pediatrics (n=1). Demographic data indicated that 65% of participants had Bachelor of Science in Nursing degrees; 58% were age 40 or greater; 35% had one to six years and 23% had 19-24 years of neonatal experience; and 52.9% were certified in their specialty areas for maternal and neonatal health (Appendix P).

Accuracy

Participants improved by 29.4% in correctly identifying NAS symptoms with the FST from pre- to post-test. Inter-observer reliability increased from 64.7% at pre-training to 94.1% at post-training in meeting the minimum benchmark goal. Participants failed to maintain the reliability benchmark of at least 90% at follow-up. A Wilcoxon Signed Rank test revealed a statistically significant decrease in reliability at the follow-up session, z= -3.650, p=.000, with a

large effect size (r= .63). Pre-training reliability had a strong, positive correlation with follow-up reliability, r=.506, n= 17, p=.038 (Appendix Q).

An incidental finding points out that accurate symptom identification does not appear to relate to total FST score (Appendix R). For example, the target Finnegan score was 13 for the infant in video one for the pre- and post-test. Pre-test scores ranged from five to 13, (Mdn= 8). Post-test scores ranged from seven to 15, (Mdn= 9). The target Finnegan score for the follow-up video was six. Follow-up scores ranged from two to 11, (Mdn= 6).

Individual item analysis illustrates the percentage of correct symptom identification. CNS areas of sleep, hyperactive Moro reflex, moderate to severe tremors undisturbed and excoriation identified a 5.8-5.9% improvement from pre- to post-test. CNS areas of markedly hyperactive Moro reflex, myoclonic jerks and mild tremors undisturbed were misidentified 5.9-17.6% in the post-training video. Metabolic, vasomotor and respiratory (MVR) disturbances of yawning, fever and respiratory rate improved by 5.9% from pre- to post-test. GI disturbances for excessive sucking improved by 5.9% from pre- to post-test. Participants missed five CNS, six MVR and one GI item on the follow-up tests (Appendix S).

Confidence

Nurses were more confident using the FST after they initially received the project training (Appendix T). The only significance in confidence change was noted from pre- to post-training. There was a strong, positive correlation between years of neonatal experience and confidence at pre-training, r=.524, n= 17, p=.038, post-training, r=.521, n= 17, p=.032, and follow-up, r=.558, n= 17, p=.020. Those with more neonatal nursing experience reported higher confidence when using the FST. No other demographic data had a significant correlation with confidence.

Process Evaluation

Student Satisfaction and Self-Confidence in Learning Questionnaire results indicated that all participants agreed, or strongly agreed, the teaching methods for the training were effective and helpful. About 94.1% of participants agreed or strongly agreed they felt confident in mastery of the educational content. Lastly, 100% of participants agreed or strongly agreed the training education on NAS increased confidence in their skill to take care of NAS infants. Qualitative analysis for themes indicate some participants reported a lack of environmental support for their nursing judgment for NAS scoring, thus impacting how they scored the infants.

Discussion

Summary

Nurses have an opportunity to improve patient outcomes for infants with NAS by accurately assessing and triaging them based on symptoms. Although some authors (Lucas & Knobel, 2012; Maguire et al., 2013; Timpson et al., 2018) used changes in total FST scores to evaluate accuracy of use of the FST, total score did not translate to correct symptom identification for this project. For example, one participant gave a follow-up NAS total score that was only one point less than the expert score of six. Yet, the participant only achieved 85% reliability due to marking three items incorrectly. Although participants may have scored at or close to the expert video score, over-scoring occurred by marking symptoms present when they were not, or at an increased severity level. Some correct symptoms were not marked at all, resulting in under-scoring.

Analyzing the proportion of correct symptom identification for each item appears to be a better indicator for correct use of the FST. Again, literature supports inter-observer reliability at 90% or greater as a benchmark for how many items are acceptable for a rater to vary from an

established score and still use a tool reliably (D'Apolito, 2014; Lucas & Knobel, 2012; Maguire et al., 2013). In this project the 90% was not maintained at follow up.

The literature suggests that nurses may lack skill and confidence using the FST tool (Lucas & Knobel, 2012; Timpson et al., 2018). Confidence does not equal competence (Lemire, 2013). In this project, although participants reported feeling confident when using the FST, they did not always accurately score symptoms on the FST tool. The project findings support the notion that nurses need advanced NAS training in order to improve symptom detection and accuracy. At minimum, training is needed during orientation and annually to help improve NAS scoring accuracy and confidence. One participant suggested a repeat of the training course every six months.

While confidence was improved from pre-training through follow-up, nurses indicated that they could benefit from additional NAS training. This may help translate confidence into enhanced competence. Since more years of neonatal experience was associated with increased FST confidence, enhanced training for nurses with less experience may support an increase in NAS knowledge and certainty.

Limitations

Several limitations were noted after project implementation and analysis. The small sample size may limit generalizability. However, that was not the intent of the project. The sample size does represent all neonatal departments and provides evidence of need for improved, sustainable effort. More representation from the pediatrics unit may provide additional knowledge about the effectiveness of the NAS training, especially for nurses who do not provide NAS care as often as those who work in Mother-Baby and the NICU.

Many participants commented on the difficulty in being able to accurately note withdrawal symptoms for the infants on the observed videos due to limited or poor video quality, especially for the follow-up video. This would have a large impact on how the participants scored the presence or absence of symptoms when using the FST. Newer videos may be available that are more user-friendly and allow viewers to visualize withdrawal symptoms more accurately.

Lastly, follow-up sessions occurred during shifts when participants were working on their units. Participants may have been distracted or felt rushed to complete the session. Conducting the follow-up sessions when participants were not already working may help provide an environment more conducive to learning.

Conclusions

Substance abuse is an epidemic and national health crisis that continues to have a negative impact on infants and their families. Infant outcomes are optimized in an environment that screens and correctly identifies symptoms (Bagley et al., 2014). Doing so ensures referral to appropriate care. This project supports findings in the literature that accurate use of the FST enables early identification of infants with NAS. This in turn may help to decrease infant length of stay, pharmacologic treatment, and reduce negative outcomes. The NAS training on correct use of the FST was able to help increase nurse confidence when using the assessment tool and show some improvement in accuracy of symptom identification. Improvement in accuracy of identifying individual withdrawal symptoms is a more appropriate indicator of correct tool use compared to measuring improvement in total score alone.

The sustainability for the project depends greatly on administrative support through funding for time nurses spend receiving this training. Positive feedback was received from unit

administrators and educators that the project highlighted the need for all staff to receive more NAS scoring education. Dissemination of project results to the agency's administration, nursing directors, neonatal providers, and neonatal nurses will provide support for the program to be part of the evidence-based practice training provided to neonatal nurses who care for infants with NAS. Cost of education time would be the main financial consideration for future training.

Having the support of the neonatal nurses in the agency will be another large factor impacting future project success. Successful practice change is more likely to occur when individuals participating have a higher level of involvement (Lewin and Grabbe, 1945). Including the charge nurses and other neonatal nurses who want to receive additional NAS training can add valuable input about ways to improve and sustain the NAS training program. Likewise, the organization must create an environment that supports and values nursing judgement.

Results from this project were disseminated on September 21, 2018 at the agency's research symposium and at a state nursing research symposium on October 12, 2018. As of this writing, an abstract has also been submitted to the Association of Women's Health, Obstetric, and Neonatal Nurses for their national conference in June 2019.

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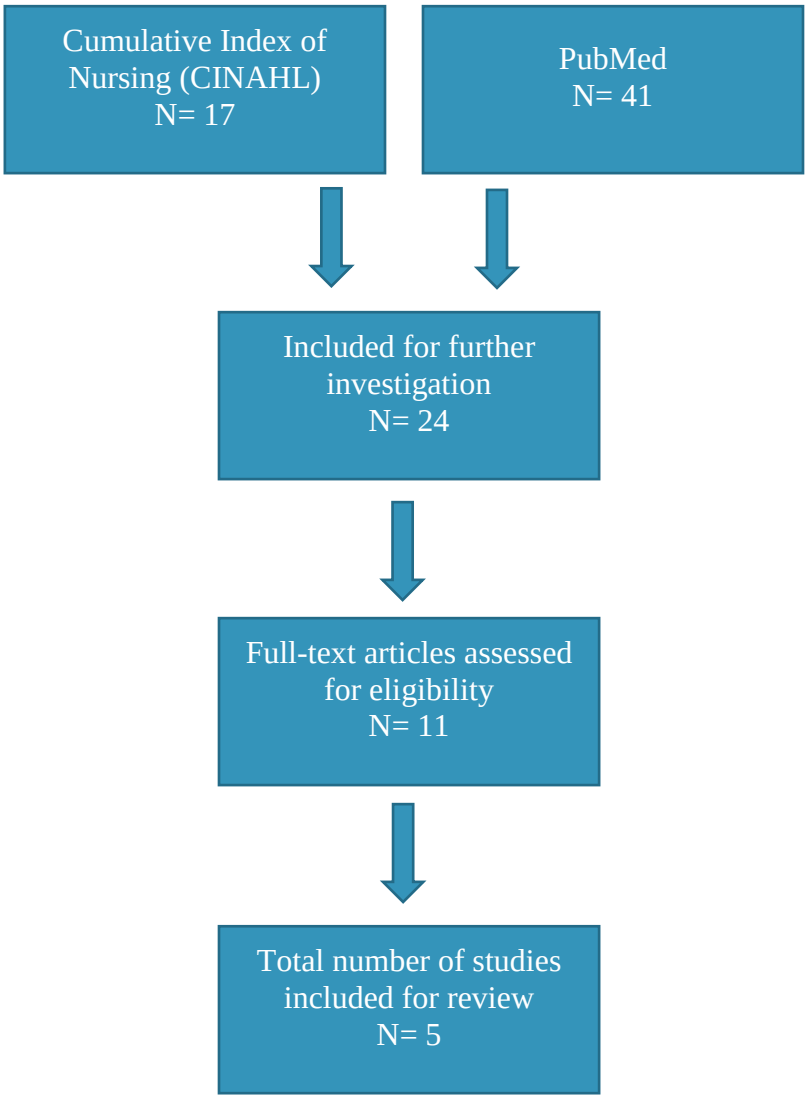
Appendix A

Diagram of Literature Search



Appendix B

Levels of Evidence Synthesis Table

Level of Evidence		Article #1 Author Year	Article #2 Author Year	Article #3 Author Year	Article #4 Author Year	Article #5 Author Year
I	Systematic Reviews Meta-analyses					
II	RCT					
III	Controlled trial without randomization					
IV	Case control Cohort Studies			Murphy-Oikonen et al., 2010		
V	Systematic Review of Qualitative or Descriptive Studies					
VI	Qualitative or Descriptive Studies EBP Implementation Projects	Timpson et al., 2018	McQueen et al., 2015		Lucas et al., 2012	Maguire 2013
VII	Expert Opinion					

Appendix C

Literature Review Analysis

Clinical Question: Determine NAS Assessment with FST in Hospitals

Citation	Study Purpose	Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables Studied & Definitions	Measurement of Major Variables	Data Analysis	Findings	Appraisal: Worth to Practice
Lucas K., & Knobel, R.B. (2012). Implementing practice guidelines and education to improve care of infants with neonatal abstinence syndrome. *Advances in Neonatal Care, 12*(1), 40-45. doi: 10.1097/ANC.0b013e318241bd73	"To develop and implement a program for the management of NAS and the use of the FNAST and knowledge gain in nurses as a result of implementation of the practice guidelines and education"	None listed	-non-experimental, pre-test/post-test -IRB approval -classroom education with DVD using FNAST followed 1 week later by interrater reliability testing with DVD	N= 68 NICU nurses Setting: Level 3 regional referral NICU	I: Educational program on NAS clinical practice guidelines and use of FNAST D: scores on NAS test for increased knowledge and accuracy of using FNAST	-NAS pre- and post-test for knowledge of NAS care -interrater reliability training with DVD	Matched paired t test: NAS pre- and post-test scores Interclass correlations: Interrater reliability	Pre-test scores: mean 85.1765, SD 10.32739 Post-test scores: mean 104.5, SD 6.28075 Score change: mean 19.3235, SD 9.06764 Paired pre-post-test samples: mean -19.32353, SD 9.06764, 95%CI (-21.51837 to -17.12869), t= -1.7573, df 67, p(2-tailed)=0.000	-poor neuro-developmental outcomes and longer LOS associated when initiation of pharmacologic management is unnecessary -education on specific medical problems helps best practice adherence -interactive learning activities help improve pt outcomes -all nurses showed between 2-44% improvement in NAS scoring post-training -limitation included low NAS population of infants and did not include clinical outcomes

									like LOS or consistency of scores past 1 week of training -participants reported positive buy-in for project sustainability and can be a cost-effective training activity -FNAST is objective tool that is easily taught to neonatal nurses and is a reliable tool to assess NAS infants Score change: 19.3235/9.06764= 2.13 large effect
Maguire, D., Cline, G.J., & Parnell, L. (2013). Validation of the finnegan neonatal abstinence syndrome tool-short form. *Advances in Neonatal Care, 13*(6), 430-437. doi: 10.1097/ANC.0000000000000033	"To reduce the number of items in the Modified FNAST to the minimum possible while retaining or improving its validity in a short version"	None listed	-retrospective chart review -IRB approval Inclusion criteria: diagnosis of NAS, first hospital admission to NICU -creation of 7 item modified short form of MFNAS tool	N= 171 infants admitted to NICU with diagnosis of NAS Setting: NICU at tertiary hospital	Factor Analysis of MFNAST	21 items on M-FNAS tool divided into 2 factors Short form total score compared to M-FNAS score	Bartlett's chi-square test and Kaiser-Meyer-Olkin Measure of Sampling Adequacy with 2 factors: mild/early withdrawal signs and moderate/ progressing withdrawal signs Pearson r: compare short form and M-FNAS scores	-2 factor solution significantly correlated with MFNAST total score ($r=0.917$, $p<.001$) -2 factor solution significantly correlated to infants scoring 8 or > on short and MFNAST ($r=0.629$, $p<.001$)	-infants with rapidly increasing withdrawal symptoms need to have 21 item MFNAS tool (short form inadequate at this point) -short form scoring of 8 or more also correlated to same scoring on long form -easier to achieve interrater reliability
McQueen, K., Murphy-Oikonen, J., &	"Evaluate the prevalence of NAS and types	None listed	-retrospective chart review	N=131 infants with NAS and documented	Primary outcome measures:	NAS presentation outcomes: age at	ANOVA followed by SNK for	-no significant difference for age of onset of	-infants exposed to methadone had prolonged

Desaulniers, L. (2015). Maternal substance use and neonatal abstinence syndrome: A descriptive study. *Maternal & Child Health Journal, 19*(8), 1756-1765. doi:10.1007/s10995-015-1689-y	of substance use during pregnancy, and determine whether the presentation of NAS symptoms differ based on the type of substance"		-ethics board review -inclusion: infants had documented NAS scores with MFST and record (maternal self-report and/or infant urine toxicology) of substance exposure	maternal substance use Setting: tertiary care hospital in Ontario	substance exposure, MFST, presentation of NAS, Group categories (methadone-only, methadone + other, single non-methadone and polysubstance non-methadone)	symptom onset, peak score, time from onset to peak of symptoms, pharmacologic treatment, length of pharmacologic treatment, LOS Type of maternal substance use impacting infants with NAS	differences between substance groups Chi square test-dichotomous data All analyses for significance used p=0.05	symptoms between groups (p=0.709) -peak score was significant for groups F (3,127)= 4.55, p=0.005 Post hoc analysis showed polysubstance non-methadone group (M=10.4, SD= 3.4) significantly lower than methadone (M= 12.3, SD= 2.5) and methadone + other (M=13.4, SD= 2.9), not significantly lower compared to single non-methadone (M=11.9, SD= 3.5) -time to peak score significantly longer for methadone group (M=55.1, SD= 40.2) compared to other 3 groups [F(3,127)= 8.28,	symptoms of NAS, pharmacologic treatment and LOS -longer peak times with methadone impact discharge planning -should consider other pharmacologic treatments if possible Effect size: small W=8.39/131(3) =√(8.3/393) =0.145

								p=<0.001] with SNK -infants exposed to methadone and methadone + other had higher pharmacologic needs, [x^2 (131, df=3)= 8.30, p=0.04] -length of pharmacologic treatment significantly[F (3,127)= 7.95, p<0.001] longer for methadone (M=13.8, SD= 8.5) and methadone + other (M=15.5, SD=11.4 compared to single non-methadone (M=7.3, SD= 6.1) and polysubstance non-methadone (M=7.2, SD=8.6) -LOS increased significantly [F(3,127)=8.56 , p<0.001] for methadone (M=17.5, SD= 7.3) and methadone + other (M=18.3, SD= 11.2) compared to	

								single non-methadone (M=11.1, SD= 6.4) and poly non-methadone (M=9.5, SD= 7.4)	
Murphy-Oikonen, J., Montelpare, W. J., Southon, S., Bertoldo, L., & Persichino, N. (2010). Identifying infants at risk for neonatal abstinence syndrome: A retrospective cohort comparison study of 3 screening approaches. *Journal of Perinatal & Neonatal Nursing, 24*(4), 366-372. doi:10.1097/JPN.0b013e3181fa13ea	"Analyze the consistency in using a standardized newborn toxicology screening protocol to identify infants at risk of developing NAS"	None listed	-retrospective cohort comparison design -IRB approval -data collected on self-reported maternal substance abuse, urine and meconium toxicology reports through retrospective chart review of infants with NAS based on FNAST	N=91 infants who received at least 1 NAS score based on FNAST Setting: NICU in regional hospital over 1 yr. period	I: new toxicology screening protocol D: detection of NAS and maternal substance abuse	-meconium and urine toxicology screening -maternal self-report of substance abuse	Compared pre-screening infant group (N=21) and post-new screening protocol (N=70) using Leven's test for homogeneity of variance	Homogeneity Testing- Similar: infant weight (P=0.38), age (P=0.82, smoking status (P=0.08, prenatal care (P=0.92), prenatal classes (P=0.82) Not similar: infant nutrition (P=0.02), alcohol (P=0.02) -29% increase post-screening tool in # infants screened for NAS -27% mothers did not self-report substances when were detected in urine screen -24% mothers did not self-report substances	-maternal self-report of substance abuse is not always accurate -need multiple ways to identify maternal substance abuse -early detection of maternal substance abuse improves NAS assessment and treatment to reduce NAS symptoms -prenatal screening can help prevent long-term effects of NAS in infants and help identify pregnant women needing substance abuse treatment and counseling -inaccurate identification of maternal substance abuse may prohibit infants from receiving needed care for NAS

								when detected in meconium screen	
Timpson, W., Killoran, C., Maranda, L., Picarillo, A., & Bloch-Salisbury, E. (2018). A quality improvement initiative to increase scoring consistency and accuracy of the finnegan tool: Challenges in obtaining reliable assessments of drug withdrawal in neonatal abstinence syndrome. *Advances in Neonatal Care, 18*(1), 70-78. doi: 10.1097/ANC.0000000000000467	"To improve accuracy and consistency of Finnegan scores among neonatal nurses"	PDSA cycle	-non-experimental adaptive design for quality improvement -survey to identify 5 areas of highest ambiguity using the Finnegan Scale -creation of restructured Finnegan Scoring Tool -creation of bedside reference guide -one single, 30 minute training session with pre-training video, discussion of 5 areas of ambiguity, and post-training video -no IRB approval needed for QI project	N= 170 neonatal nurses Setting: UMass Memorial Center Level III NICU and newborn nursery	I: single-session NAS training (video, education, restructured Finnegan Scoring Tool, bedside reference guide) D: Finnegan scores pre- and post-training (reliability) compared to target score (accuracy) for NAS	-Restructured Finnegan Scoring Tool: physiologic subcategories of disturbance (CNS, MVR and GI) -video Finnegan target score of 8	Related-Samples Wilcoxon Signed Rank and Kendall's Coefficient of Concordance: evaluated training, bedside reference guide and restructured Finnegan tool Related-Samples Wilcoxon Signed Rank: evaluated pre- and post-training Finnegan scores Mean scores, SD, variance and 95% CI: pre- and post-training scores	P<.05 used for significance Finnegan target score (8) increased to 34.7% (mean error= 0.559, SD= 1.4) post-training compared to pre-training scores of 18.8% (mean error= 1.31, SD= 1.95; Wilcoxon, p<.001) -Finnegan scores significantly higher pre-training (mean= 9.31, SD= 1.95) compared to post-training (mean= 8.56, SD= 1.4, Wilcoxon p<.001) -3 yr. follow-up (mean= 9.16, SD= 1.8) -score variance 3.80 pre-training compared to post-training variance 1.96, (Kendall's	-post-training reduction in overrating severity has significant impact when scores are used for determining pharmacologic therapy 8.56-9.31 divided by (1.95+ 1.4)/2= .4 small effect -routine training and education improves consistency and accuracy using NAS tool (need at least every 6 months to help with scoring consistency)

								Coefficient, p<.001) -CNS scoring pre-training mean 6.24 (SD 1.93) compared to post-training 5.43 mean (SD 1.38) -no statistical difference for pre- and post-training MVR scores	

Abbreviation List:
ANOVA- One-way Analysis of Variance
CI- confidence intervals
CNS- central nervous system
FNAST- Finnegan Neonatal Abstinence Scoring Tool
GI- gastrointestinal system
LOS-length of stay
MFST- Modified Finnegan Scoring Tool
MVR- metabolic/vasomotor/respiratory systems
NAS- neonatal abstinence syndrome
SD- standard deviation
SNK- Student-Newman-Keul post hoc comparisons
QI- quality improvement

Appendix D

Literature Review Synthesis

Studies	Design	Sample	Outcome
Lucas (2012)	-Non-experimental, pre-test/post-test -EBP implementation	N= 68 NICU nurses	-NAS scoring improved for all nurses after training education -positive training program buy-in from nurses related to knowledge gained for more objective NAS scoring and assessment -unnecessary initiation of pharmacologic management increases LOS and poor neuro-developmental outcomes
Maguire (2013)	Retrospective chart review: what were effects of 7 item short form of M-FNAS tool on NAS scoring	N= 171 infants admitted to NICU with diagnosis of NAS *92 male, 79 female infants	-short form easier to achieve interrater reliability compared to standard 21 item M-FNAS tool -short form scoring of 8 or more also correlated to same scoring on standard form -infants with rapidly increasing withdrawal symptoms should have assessment with 21 item standard tool

Studies	Design	Sample	Outcome
McQueen (2015)	Retrospective chart review: prevalence of NAS, type of maternal substance use and whether NAS symptoms differ based on type of substance	N= 131 infants with NAS and documented maternal substance use *71 male, 60 female infants	-infants with methadone have prolonged symptoms of NAS, LOS and pharmacologic treatment -should consider other pharmacologic treatments other than methadone -high NAS rate for study may be due to higher incidence of substance abuse in area and/or enhanced NAS detection and/or toxicology documentation of substance abuse
Murphy-Oikonen (2010)	Retrospective cohort comparison design	N= 91 infants who received at least 1 NAS score based on FNAST *Group 1: 43% male, 57% female *Group 2: 54% male, 46% female	-maternal self-report of substance use is not always accurate and may prohibit infants from receiving appropriate care for NAS -early detection of maternal substance abuse improves NAS assessment and treatment of NAS symptoms -prenatal screening with infant urine and meconium toxicology testing improves substance detection
Timpson (2018)	Non-experimental adaptive design for quality improvement	N= 170 neonatal nurses *101 NICU, 69 Newborn Nursery nurses	-post-training reduction in overrating severity has significant impact when NAS scores are used for pharmacologic treatment -routine training and education improves consistency and accuracy using NAS tool

Interventions/Outcomes

Intervention: NAS training program

	Studies	Lucas (2012)	Maguire (2013)	McQueen (2015)	Murphy-Oikonen (2010)	Timpson (2018)
Outcomes						
Nurse confidence		*				*
Improved NAS scoring accuracy and interrater reliability		*	*			*
Decreased LOS		*			*	
Nurse buy-in		*				*
Improved detection of maternal substance abuse				*	*	
Reduction in overrating severity						*

Operational Definitions

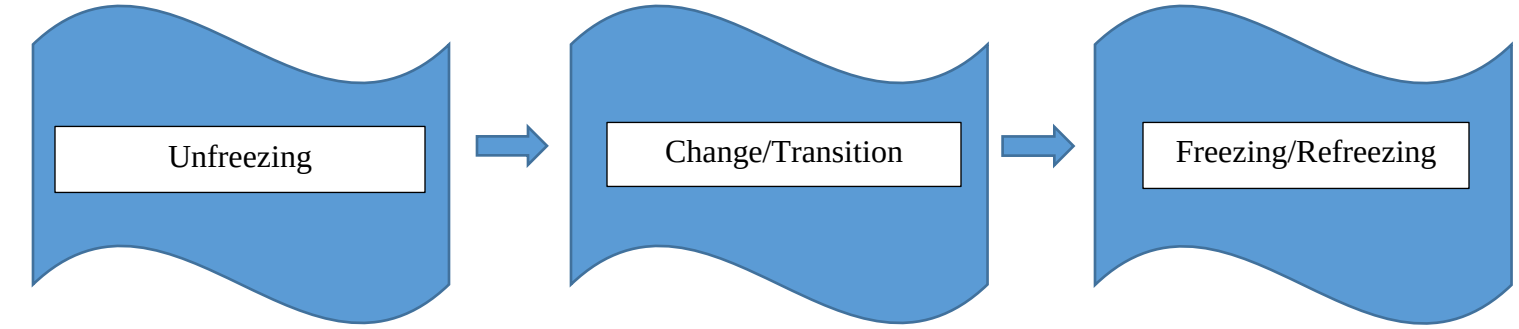
Intervention: NAS training program

Term	Lucas (2012)	Maguire (2013)	McQueen (2015)	Murphy-Oikonen (2010)	Timpson (2018)
Neonatal abstinence syndrome (NAS)	-multi-symptom syndrome that abnormally impacts central nervous, autonomic, respiratory and GI systems in infant due to transfer of harmful substances during pregnancy from mother that ends at time of delivery	-group of withdrawal symptoms noted in infants due to intrauterine exposure to drugs	-generalized disorder experienced by infants from opiate withdrawal	-group of withdrawal symptoms noted in infants from drugs of addiction like barbiturates, opiates and methadone	-withdrawal and dysregulated behaviors noted in newborns exposed in utero to opioids
NAS Finnegan scoring tool	-FNAST (Finnegan Neonatal Abstinence Scoring Tool)	-Modified Finnegan Neonatal Abstinence Score (M-FNAS)	-Modified Finnegan Scoring Tool (MFST)	-Finnegan Scoring Tool	-Finnegan Neonatal Abstinence Scoring System (Finnegan Scale)
Nurses using NAS scoring tool	-NICU	-NICU	-not stated (nurses caring for newborns)	-not stated (nurses caring for newborns)	-NICU and Newborn Nursery
Interrater reliability Acceptability	-NAS scores between nurses are 90% or >	-NAS scores between nurses meet 0.90	-not listed	-not listed	-NAS scores between nurses are +/- 1 point
Maternal substance abuse	-fetal exposure to opioids or opioid derivatives	-illicit substances identified from maternal report or urine drug screen	-illicit substances that affect pregnant woman and neonate -drugs of addiction include opiates, barbiturates, methadone, heroin	-any drug that can lead to NAS (not nicotine)	-newborns exposed in utero to opioids

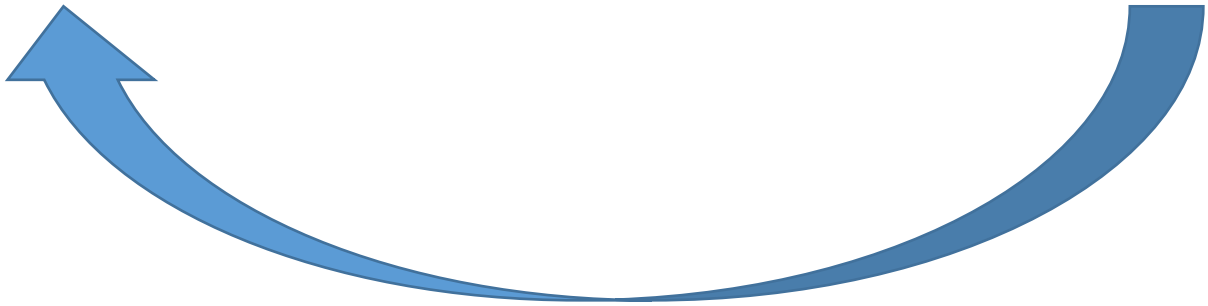
Abbreviation List: EBP- evidence based practice; FNAST- Finnegan Neonatal Abstinence Scoring Tool; GI- gastrointestinal system; LOS-length of stay; MFNAS- Modified Finnegan Neonatal Abstinence Score; MFST- Modified Finnegan Scoring Tool; NAS- neonatal abstinence syndrome

Appendix E

Lewin's Theory of Change

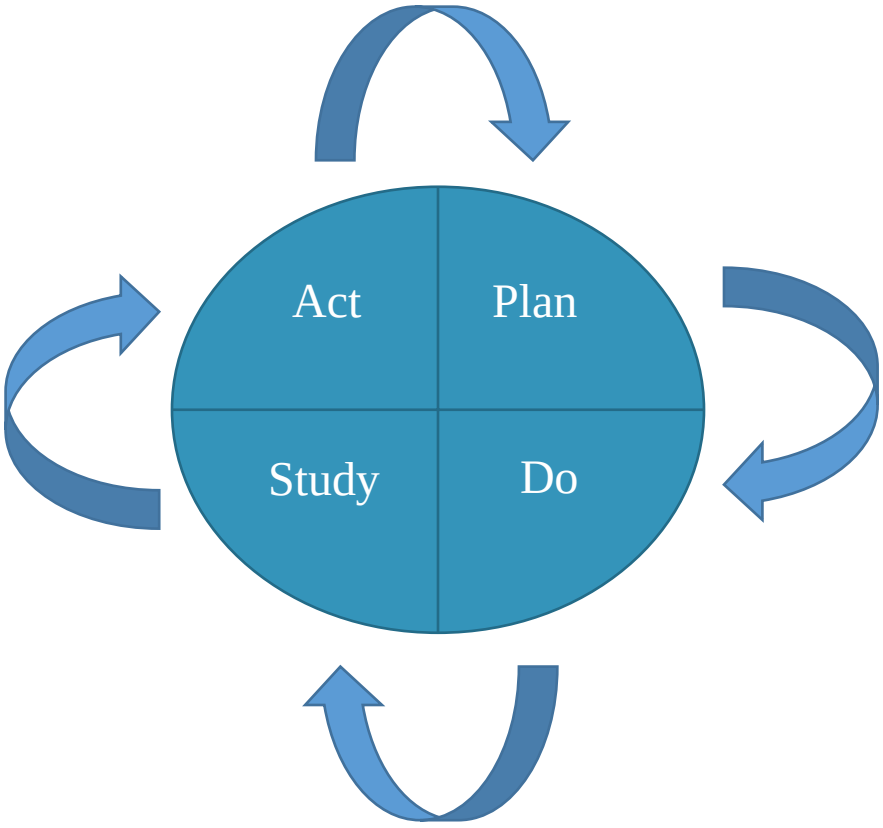


*challenge status quo *gather data *identify problem *decide if change is needed *establish driving and restraining forces	*form plan with goals and objectives *plan time for change to occur *include methods to evaluate and modify the change after implementation	*re-establish equilibrium with new change= new norm *reinforce and support new change *incorporate new policies and procedures to sustain change



Appendix F

PDSA Cycle for Process Improvement Change



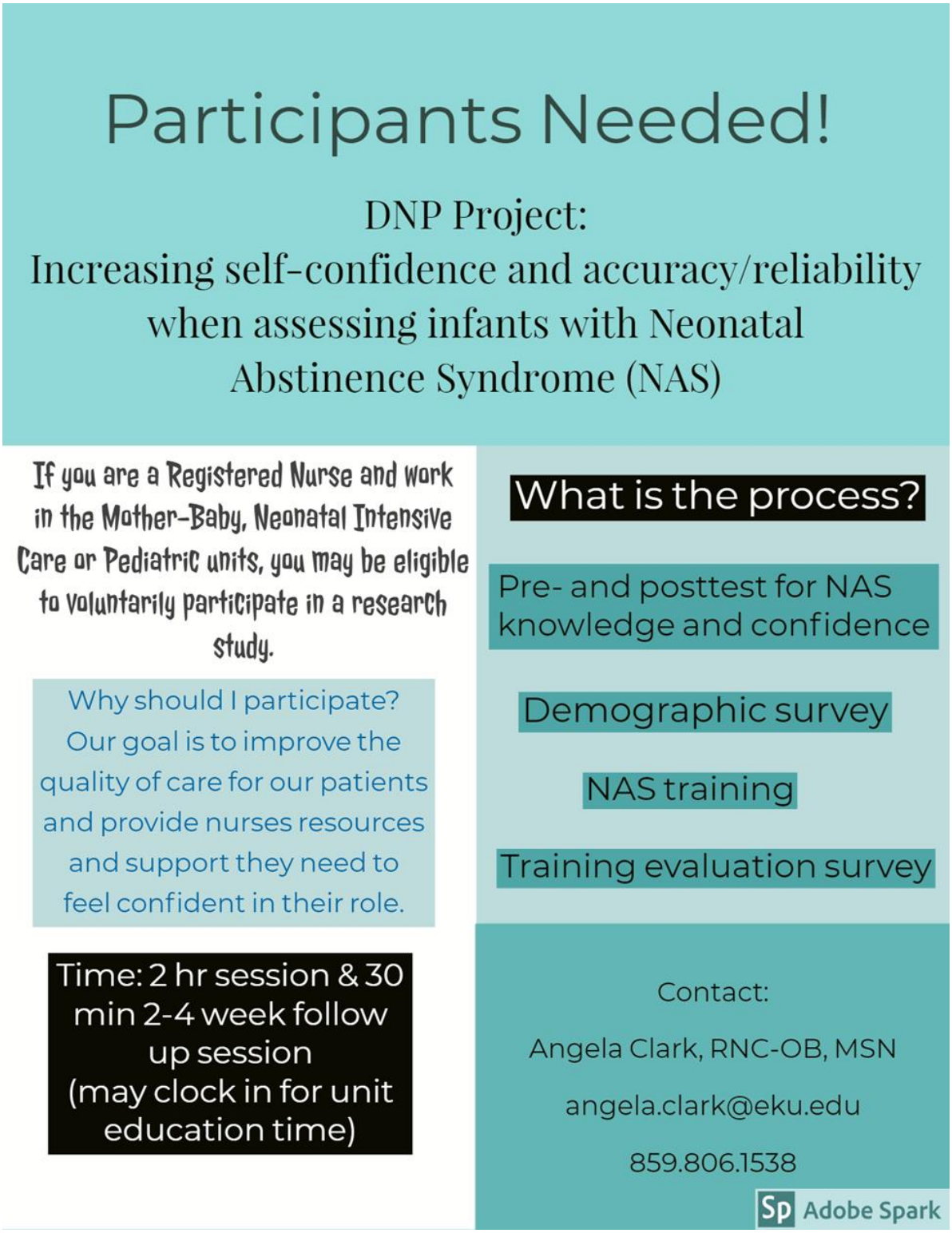
Appendix G

FST Pilot Project Timeline

Activities	June 2018	July 2018	Aug 2018	Sept 2018
Apply for agency IRB approval	X			
Apply for university IRB Authorization Agreement	X			
Meet with agency administration	X			
Meet with agency neonatal nursing unit directors and educator	X			
Distribute recruitment flyers and email	X			
Reserve training education room at agency	X			
Collect agency internal data for project	X	X	X	
Provide NAS educational training session		X		
Provide NAS follow up session			X	
Analyze data from all surveys, questionnaires and NAS scoring tests		X	X	X
Complete project report				X
Disseminate project report with agency				X

Appendix H

Recruitment Flyer



Appendix I

Institutional Review Board Approvals

This has been deidentified and available upon appropriate request

Contact author

Appendix J

Recruitment Email

Have you ever wanted to increase your self-confidence and accuracy when assessing infants with Neonatal Abstinence Syndrome (NAS)???

Dear Neonatal Nurse,

You are invited to participate in a nursing research study at XXXXXXXX. I am interested in the impact of an educational program on use of the Finnegan Scoring Tool (FST) on the accuracy and reliability of Neonatal Abstinence Syndrome (NAS) scoring as well as the impact on nurse confidence when using the FST. **I plan to use the information gained from this study to help promote evidence-based care of infants with NAS as well as promote nurse confidence when scoring withdrawal symptoms with the FST.**

Participation in this study involves attending an educational training session where you will receive NAS training on use of the FST with the Neo Advances Inter Observer Reliability Training Program. The training will take place on Monday, July 23 and Tuesday, July 24, 2018 in the XXXXX. You will attend only 1 initial session.

The initial training session will take approximately 2 hours. The follow-up training session will take about 30 minutes. You will be able to clock in under unit education for time spent in these training sessions. Only nurses who are participating in the study may clock in for training time.

Your participation or lack of participation will not change your employment at XXXXX. The only risk to you is the potential loss of confidentiality. If you agree to participate, all infant scoring sheets, surveys and questionnaires will be part of the data collection. All responses are anonymous and will be kept in a confidential file that only the principle investigator and faculty advisor can access.

Completing the training session documents can contribute to our knowledge about the accuracy and reliability of use of the FST by neonatal nurses scoring infant withdrawal symptoms as well as the impact on nurse confidence with additional NAS training. Thank you in advance for your anticipated participation! **Please email me to let me know if you would like to participate no later than July 20, 2018.** I am happy to answer any questions!

Sincerely,

Angela Clark, RNC-OB, MSN, BSN
DNP student at Eastern Kentucky University
Angela.clark@eku.edu 859-806-1538

Appendix K

Implied Consent

Dear RNs working in the Pediatric, Mother-Baby and Neonatal Intensive Care units,

You are invited to participate in a nursing research study at XXXXX. I am interested in the impact of an educational program on use of the Finnegan Scoring Tool (FST) on the accuracy and reliability of Neonatal Abstinence Syndrome (NAS) scoring as well as the impact on nurse confidence when using the FST. I plan to use the information gained from this study to help promote evidence-based care of infants with NAS as well as promote nurse confidence when providing NAS care and scoring withdrawal symptoms when using the FST.

Participation in this study involves attending an educational training session where you will watch and score infant withdrawal symptoms with the FST, as well as complete a demographic survey and self-confidence questionnaire. At the end of the training session, you will watch and score a video of an infant assessed for withdrawal symptoms with the FST and complete another self-confidence questionnaire. A post-training evaluation questionnaire will be completed at the end of the educational session. A follow up training session will take place 2-4 weeks after the initial training session that will involve watching another video of an infant assessed for withdrawal symptoms. You will complete another FST as well as a self-confidence questionnaire. The initial training session will take approximately 2 hours. The follow-up training session will take approximately 30 minutes. If you agree to participate, all infant scoring sheets, surveys and questionnaires will be analyzed as part of the data collection. All responses are anonymous. You will be able to clock in under unit education for time spent in these training sessions. Only nurses who are participating in the study may clock in for training time.

Your participation or lack of participation will not change your employment at XXXXX. The only risk to you, if you choose to participate, is the potential loss of confidentiality. We will make every effort to prevent anyone who is not on the research team from knowing that you gave us information. Any information you provide will be kept in a confidential file that only the principle investigator can access. This study may be reviewed by the XXXXXX Institutional Review Board (IRB).

Completing the training session documents can contribute to our knowledge about the accuracy and reliability of use of the FST by neonatal nurses scoring infant withdrawal symptoms as well as the impact on nurse confidence. Study results may be submitted for publication in a national journal but you will not be identified as a participant in the study. Of course, you have a choice about whether or not to complete the training assessment scoring sheets and questionnaires, but if you do participate, you are free to skip any questions or discontinue at any time.

Thank you in advance for your anticipated participation.

Angela Clark, RNC-OB, MSN, BSN
DNP student at Eastern Kentucky University
Angela.clark@eku.edu
859-806-1538

Appendix L

Demographic Questionnaire

Please write your mother's date of birth in the format MM/DD/YYYY: _____

1. Age in years:
   ___ 18-28 ___ 29-39 ___ 40-50 ___ 51-61 ___ 62 or older

2. Highest level of nursing education completed:
   ___ Diploma
   ___ ADN
   ___ BSN
   ___ MSN
   ___ Post-Master's Certificate
   ___ DNP
   ___ PhD
   Other (please specify) _____

3. Please list any National Nursing Certifications:
   _____

4. Total years of nursing experience:
   ___ Less than 1 year
   ___ 1-6 years
   ___ 7-12 years
   ___ 13-18 years
   ___19-24 years
   ___ 25 or more years

5. Total number of years working as a neonatal nurse in the Mother-Baby, Neonatal Intensive Care or Pediatric units:
   ___ Less than 1 year
   ___ 1-6 years
   ___ 7-12 years
   ___ 13-18 years
   ___ 19-24 years
   ___ 25 or more years

6. Primary hospital unit:
   ___ Mother-Baby
   ___ Neonatal Intensive Care
   ___ Pediatrics

Appendix M

Self-Confidence Questionnaire

Please write your mother's date of birth in the format MM/DD/YYYY: _____

Please rate your personal level of confidence when using the Finnegan Scoring Tool to score infants for Neonatal Abstinence Syndrome.

Use the following Likert scale-

0= no confidence

1= slight confidence

2= moderate confidence

3= high confidence

Your answer: _____

Appendix N

Finnegan Scoring Tool

This has been deidentified and available upon appropriate request

Contact author

Appendix O

Student Satisfaction and Self-Confidence in Learning Questionnaire

This has been deidentified and available upon appropriate request

Contact author

Appendix P

Participant Demographics

Units

Unit	Number of Participants	Percentage of Participants
Mother-Baby	11	65%
NICU	5	29%
Pediatrics	1	6%

Age of Participants

Age in Years	Percentage of Participants
18-28	12%
29-39	24%
40-50	29%
51 or greater	29%
Not reported	6%

National Specialty Certifications

National Certifications	Percentage of Participants
MNN, NICU, Infant Massage, Lactation	52.9%

Highest Level of Nursing Education

Highest Level of Nursing Education	Percentage of Participants
Associate of Science in Nursing	23%
Bachelor of Science in Nursing	65%
Master of Science in Nursing	12%

Years of Experience

Years of Experience	Percentage of Participants: Neonatal Experience	Percentage of Participants: Total Nursing Experience
Less than 1	6%	6%
1-6	35%	23%
7-12	12%	6%
13-18	18%	12%
19-24	23%	29%
25 or more	6%	24%

Appendix Q

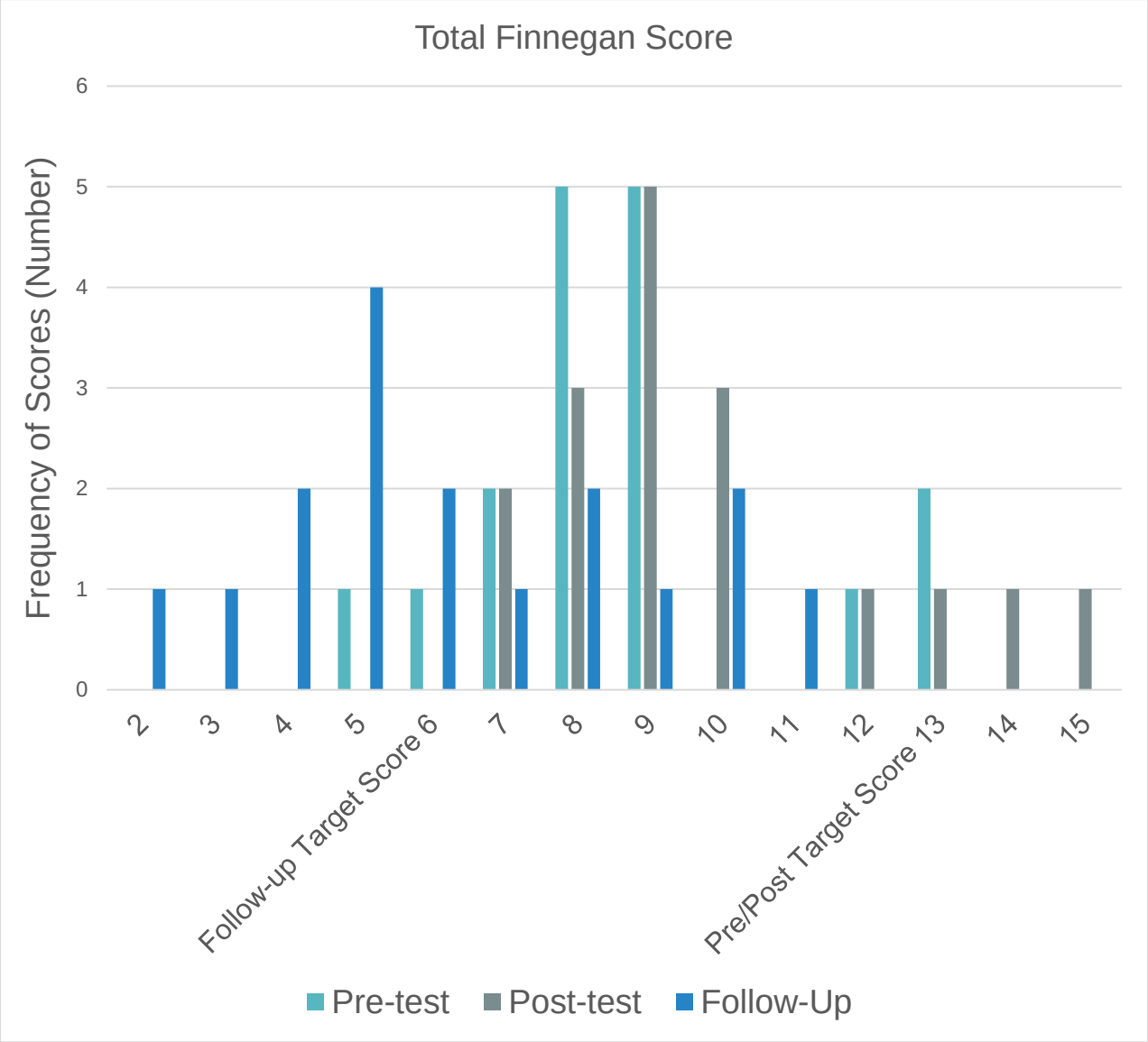
Reliability Data

Percentage of Participants Achieving FST Reliability/Accuracy Goal of ≥ 90%

Unit	**Pre-test Reliability**	**Post-test Reliability**	**Follow-up Reliability**
Mother-Baby (n=11)	35.3%	64.7%	0%
NICU (n=5)	29.4%	23.5%	0%
Pediatrics (n=1)	0%	5.9%	0%

Appendix R

Total Finnegan Scores



Appendix S

Individual FST Symptom Analysis

CNS Disturbances

Symptom	% Correct Pre-test	% Correct Post-test	% Correct Follow-up
Crying: Excessive High Pitched	100	100	94.1
Crying: Cont. High Pitched	100	100	100
Sleeps <1hr after feeding	100	100	100
Sleeps <2hrs after feeding	100	100	100
Sleeps <3hrs after feeding	94.1	100	94.1
Hyperactive Moro Reflex	58.8	64.7	64.7
Markedly Hyperactive Moro Reflex	100	82.4	100
Mild Tremors: Disturbed	70.6	70.6	58.8
Mod-Severe Tremors: Disturbed	70.6	70.6	5.9
Mild Tremors: Undisturbed	94.1	88.2	94.1
Mod-Severe Tremors: Undisturbed	11.8	17.6	100
Increased Muscle Tone	100	100	41.2
Excoriation	94.1	100	70.6
Myoclonic Jerks	100	94.1	100
Generalized Convulsions	100	100	100

Green: increase in symptom identification pre- to post-test
Red: decrease in symptom identification pre- to post-test
Gold: decrease in symptom identification from pre- and post-test at follow-up

Metabolic, Vasomotor & Respiratory Disturbances

Symptom	% Correct Pre-test	% Correct Post-test	% Correct Follow-up
Sweating	100	100	100
Fever 37.2-38.3 Degrees C	94.1	100	94.1
Fever 38.4 Degrees C or >	94.1	100	100
Yawning	94.1	100	35.3
Mottling	100	100	88.2
Nasal Stuffiness	100	100	82.4
Sneezing	100	100	100
Nasal Flaring	100	100	100
Respiratory Rate >60	94.1	100	29.4
Respiratory Rate >60 with Retractions	100	100	23.5

Green: increase in symptom identification pre- to post-test
Gold: decrease in symptom identification from pre- and post-test at follow-up

Gastrointestinal Disturbances

Symptom	% Correct Pre-test	% Correct Post-test	% Correct Follow-up
Excessive Sucking	88.2	94.1	35.3
Poor Feeding	100	100	100
Regurgitation	100	100	100
Projectile Vomiting	100	100	100
Loose Stool	100	100	100
Watery Stool	100	100	100

Green: increase in symptom identification pre- to post-test
Gold: decrease in symptom identification from pre- and post-test at follow-up

Appendix T

Confidence Results

Confidence Ratings

Confidence Rating	Pre-test (n=17)	Post-test (n=17)	Follow-Up (n=17)
Slight Confidence	2	0	3
Moderate Confidence	12	9	9
High Confidence	3	8	5

Confidence Scores

Training Session	Mean	*SD*	*t*	*df*	*p*
Session one (pre)	2.06	.51	-3.35	16	.004*
Session one (post)	2.47				
Session one (pre)	2.06	.43	-.57	16	.579
Session two (follow-up)	2.12				

*p <.05