Developing training to address neonatal nurse Knowledge, Practice, and Perceived Attitude for Neonatal Abstinence Syndrome

Rebekah Draper

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Developing Training to Address Neonatal Nurse Knowledge, Practice, and Perceived Attitude for Neonatal Abstinence Syndrome

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In Partial Fulfillment of the Requirements for the degree of Doctor of Nursing Practice

School of Nursing

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# Table of Contents

List of Tables..............................................................................................................iv
List of Figures.............................................................................................................v
Abstract.....................................................................................................................vi
Introduction...............................................................................................................1
  Available Knowledge
  Neonatal Abstinence Syndrome Clinical Practice Evidence
  Nurse Attitudes Towards the Care of Infants Experiencing NAS & Families
  Evidence for Educating Nurses who Care for Infants with NAS
Rationale.....................................................................................................................9
  IHI Psychology of Change Model
  Design Thinking Method
Aims.........................................................................................................................12
Methods....................................................................................................................12
  Context
  Designing an Intervention
  Study of the Intervention
Measures..................................................................................................................18
  Quantitative
  Qualitative
  Ongoing Assessment
  Data Accuracy
Analysis....................................................................................................................22
  Quantitative Data
  Qualitative Data
  Variation
Ethical Considerations..............................................................................................23
Results.......................................................................................................................24
Phase 1: Baseline Survey
Phase 2: Interviews/Empathy
Phase 3: Interview and Prototype (Empathy/Ideate/Design)
Phase 4: Prototype Testing and Development (Test/Evaluation/Ideate)

Discussion .........................................................................................................................41

Recommendations

Facilitators and Barriers

Limitations

Conclusion ..........................................................................................................................49

Appendix A .......................................................................................................................50

Appendix B .......................................................................................................................51

Appendix C .......................................................................................................................52

References ..........................................................................................................................54
List of Tables

Table 1  Participant Attitudes Regarding Care of Infants with NAS  26
Table 2  Participant Knowledge Regarding Care of Infants with NAS  28
Table 3  Participant Perceptions Regarding Clinical Practice in NAS Care  30
Table 4  Summary Report of the Case Study  32
Table 5  Thematic Analysis from Empathy Maps  37
## List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>IHI Psychology of Change Framework</td>
<td>11</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Design Thinking Process</td>
<td>14</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Empathy Map</td>
<td>15</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Empathy Map Example</td>
<td>33</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Prototype 1</td>
<td>39</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Prototype 2</td>
<td>40</td>
</tr>
</tbody>
</table>
Abstract

**Background:** Neonatal abstinence syndrome (NAS) is increasing in the United States as a result of increased opioid-use disorder among women of childbearing age. NAS affects three out of four babies who are exposed to chronic use of opioids during the mother’s pregnancy. Caring for infants with NAS is challenging. Researchers have identified a deficit of knowledge and skills, and have discovered judgmental attitude of nurses caring for babies with NAS. Globally, nurses caring for infants with NAS need education on current evidence-based practice to improve quality of care. The purpose of this project was to create an educational intervention based on assessed, localized, educational needs for NICU staff nurses caring for babies experiencing NAS. **Methods:** This project used the design thinking implementation framework and IHI Psychology of Change framework to assess the needs of NICU nurses caring for infants experiencing NAS and develop related education. A baseline survey of the nurses’ knowledge, attitudes, and practices was done. Similarly, nurse stakeholder interviews were completed and themes were analyzed using thematic content analysis to further specify localized needs. Educational materials were prototyped in subsequent interviews with the nurses until the materials were found useful. **Findings/Results:** RNs correctly identified symptoms and treatment for NAS. RNs overall felt empathy for infants with NAS, but less empathetic towards the infant’s mothers and blamed them for the infant’s health problems. The RNs were confident in their knowledge to provide adequate care for the infants but self-identified a need for improvement in knowledge, care, and documentation. RNs appropriately use nonpharmacological treatment, but desire more education in the interventions. Other areas for needed improvement were medication treatment, in-home
and outpatient care, and parameters for breastfeeding. RNs identified educational needs through interviews and provided feedback on the two prototypes created using empathy mapping. **Conclusions:** The proposed next step is to implement the designed educational intervention and study related outcomes. The IHI Psychology of Change Framework and the design thinking process, when combined, offer a strong method for participant engagement. The design thinking process may be important to timely and effective care in-so-much that it allows flexibility to change as the context changes.

Key words: Neonatal Abstinence Syndrome, staff nurse Education, Design Thinking, change theory
Developing Training to Address Neonatal Nurse Knowledge, Practice, and Perceived Attitude for Neonatal Abstinence Syndrome

Available Knowledge

Neonatal Abstinence Syndrome (NAS) is increasing in the United States (US). NAS affects more than 24,000 infants annually (National Institute of Health [NIH], 2015). Infants born to mothers who regularly use opiates and other substances may experience withdrawal and be diagnosed with NAS (March of Dimes, 2015). More than 20,000 pregnant women reported using opioids in 2016 (Substance Abuse and Mental Health Services Administration [SAMHSA], 2018). As many as 80% of infants born to mothers with opioid use disorder (OUD) develop NAS and are often treated in a hospital setting (Grisham et al., 2019; Saia et al., 2016; Sanlorenzo, Stark, & Patrick, 2018).

Infants who develop NAS require treatment for withdrawal symptoms along with other related complications, including failure to thrive, prematurity, seizures, and neurological damage (National Institute of Health [NIH], 2015). Symptoms of NAS include irritability, excessive crying, poor sleep quality, skin excoriation, seizures, sweating, mottling, elevated temperature, excessive yawning, tachypnea, vomiting, excessive sucking, and poor feeding (Academy of Neonatal Nursing, 2007). NAS can be deadly (NIH, 2015). Infants may require both non-pharmacological and pharmacological treatment to avoid significant health problems and intense withdrawal symptoms. Treatment of the acute phase of NAS may last up-to thirty days after birth (March of Dimes, 2015).

Beyond the physical and emotional cost to the infants and their families, there is an important financial cost associated with NAS. Health care costs associated with NAS
have increased over the past twenty years and bed space in the neonatal intensive care units has become restricted (Gomez-Pomar & Finnegan, 2018, Grisham et al., 2019). A large majority of NAS infants in Virginia receive Medicaid services and each admission is about $50,000 with a daily NICU rate of $1,246 (França, Mustafa, & McManus, 2016; Virginia Hospital & Healthcare Association [VHHA], 2016). In addition to burden on the healthcare system, other burdens exist to families and society because infants who are born dependent on opiates may have long-lasting effects throughout their lifespan, requiring support, care, and ongoing treatment.

Neonates experiencing NAS require high levels of nurse knowledge, education, and assessment skills. There are some evidence-based recommendations for the management of infants with NAS to guide these nurses and also other providers. Within localized settings however, the care for infants with NAS is too often left to the experience and expertise of the healthcare providers who may not be aware of current evidence (American Academy of Pediatrics Committee on Drugs, 2012, updated in 2014; MacMullen, Dulski, & Blobaum, 2014). This lack of application of the current evidence within local settings is concerning, particularly given the unique and intense needs of the NAS population. 

Education for how to care for infants with NAS is important not only for the benefit of the infants but also for nurses’ wellbeing. The day-to-day care for these infants can be emotionally and physically demanding for nurses. Infants with NAS are difficult to console, manage, and treat (Romisher, Hill, & Cong, 2018). Neonates must safely wean off opioid substances with specialized care (Sanlorenzo et al., 2018).
There is a significant problem with NAS in a non-profit hospital setting in Southwestern Virginia (VA), yet little is known about the specific needs. Within the local health care system, there are approximately one hundred babies born annually with NAS (J. Hays, personal communication, May 22, 2019). Infants who have been identified as being at risk for NAS stay a minimum of five days in the nursery for observation (J. Hays, personal communication, May 22, 2019). In VA, during the first two quarters of 2018, the southwestern region has the largest number of infants with NAS in the state and this number is up 31% from 2017 with an average of 260 cases per quarter of all live births (Virginia Hospital & Healthcare Association [VHHA], 2018). Three out of four infants with NAS in VA receive Medicaid coverage (VHHA, 2017). Outside of these basic demographics, very little is known about the care of this population in the local setting. Although the specific nature of the localized problem is unclear, there is a significant localized need. In the following, relevant previous studies are explored to summarize the globally available knowledge by content area. Clinical practice evidence is reviewed along with evidence regarding nurse attitude. Finally, the role of educating nurses is explored for potential to change clinical outcomes by improving nurse clinical knowledge and changing attitudes. First related clinical practice evidence.

Available Knowledge

Neonatal Abstinence Syndrome Clinical Practice Evidence

Infants should be assessed and scored consistently with an appropriate scoring withdrawal assessment tool (AAP, 2012). The 21 item Finnegan Neonatal Abstinence Scoring tool, or a modified version of it, is most commonly used in US hospitals to score
level of withdraw in infants (Delvin, Lau, & Radmacher, 2017; Sanlorenzo et al., 2018; Sarkar & Donn, 2006). Yet, the Finnegan NAS scoring tool is known to be subjective and can be utilized incorrectly and inconsistently, leaving room for variability in scoring and treatment (Grisham et al., 2019; Starker & Donn, 2006). Studies have shown that Finnegan scores and NAS severity differ among the drug exposure, the dosage, and the multi-drug use in pregnancy (Delvin, Lau, & Radmacher, 2017; Sarkar & Donn, 2006). This is concerning given that the American Academy of Pediatrics recommends that a consistent scale should be used for assessment and treatment as well as overall monitoring of infants with NAS (AAP, 2012). A newer approach, called Eat, Sleep, Console, which scores infants with NAS on eating, sleeping, and consolability, has been found to utilize less pharmacological exposure from 98% to 14%; it shows a decreased length of stay (Grisham et al., 2019; Grossman et al., 2018, Wachman et al., 2018).

Infants who withdraw are at risk for physiological instability, seizures, weight loss, and fever (Boucher, 2017). Therefore, infants should not be made to withdraw without pharmacologic intervention when assessment tool scores are high. If indicated, morphine or methadone should be gently tapered to decrease significant withdrawal symptoms (Bagley, Wachman, Holland, & Brogly, 2014; Kraft & Van den Anker, 2012; Wiles et al., 2014). Conversely, the use of opioids during the neonatal period or longer than the hospitalization period may increase risk of developmental delays and dysfunction (Boucher, 2017). Thus, the use of pharmacologic intervention should be carefully monitored and non-pharmacologic interventions should also be utilized when possible.

In appropriate cases, non-pharmacological methods may be used for treatment of
DEVELOPING TRAINING FOR NAS

withdrawal symptoms and prevention of complications for infants experiencing NAS with positive outcomes such as decreased withdrawal symptoms and reduced length of stay (McQueen, Murphy-Oikonen & Desaulniers, 2015). Current treatment involves decreased stimulation with support for neurodevelopmental and physiologic stability (Boucher, 2017). Examples of interventions that decrease simulation include a quiet environment, clustered care, decreased lighting, pacifier use, and breastfeeding. Methods such as gentle awakening, rocking, volunteer cuddlers, and positioning techniques have also shown effectiveness (MacMullen, Dulski, & Blobaum, 2014). Infants should also be held and swaddled for comfort (Boucher, 2017; Edwards & Brown, 2016, Wiles et al., 2014). Other interventions include music therapy, massage, and waterbeds (MacMullen, Dulski, & Blobaum, 2014). Decreased length of stay, opioid exposure, symptoms, and need for treatment have been associated with mothers remaining in the hospital with their infants (Bagley et al., 2014; Boucher, 2017; Edwards & Brown, 2016; Saiki et al., 2010). The practice of mothers rooming in and providing one-on-one support and care for infants has shown to decrease the length of stay (Jambert-Gray, Lucas, & Hall, 2009). Conversely, impaired maternal-infant bonding and poor behavioral outcomes may occur from separation of mother and infant (Boucher, 2017).

Breastfeeding is highly encouraged in mothers who participate in opioid treatment programs (Bagley, Wachman, Holland, & Brogley, 2014; Jambert-Gray et al., 2009; Wiles et al., 2014). Breastfeeding and kangaroo care have been found to be helpful for soothing and calming infants experiencing NAS as well (Bagely et al., 2014). Breastfeeding shows a reduction in withdrawal severity and lowers NAS scores, reducing the need for pharmacological treatment (Edwards & Brown, 2017). Breastfeeding allows for a steady
amount of drug to be passed from the mother to the infant through breast milk (Kraft & Van den Anker, 2012; MacMullen, Dulski, & Blobaum, 2014). As breastfed infants grow, they are naturally weaned because smaller doses per kilogram of weight are transferred to the infant. However, only 24% of opioid-dependent mothers breastfeed their infants; 60% stop around day six of life on average (Wachman, Bryun, & Phillip, 2010). Nurses and providers should be careful to monitor the breastfeeding frequency as many mothers abruptly stop breastfeeding, putting their infant at risk of worsening symptoms (Wiles et al., 2014).

Infants who are withdrawing have increased caloric needs. The reasons for increased caloric needs are due to the high use of calorie-wasting activities of muscle rigidity, increased temperature, pulse, blood pressure, sweating, sucking, crying, and increased bowel motility with limited absorption (MacMullen, Dulski, & Blobaum, 2014). These infants tend to have loose stools frequently, increasing water and calorie loss leading to skin breakdown (MacMullen, Dulski, & Blobaum, 2014). Moreover, these infants have difficulty with weight gain and may also have weight loss (MacMullen, Dulski, & Blobaum, 2014; Wiles et al., 2014). These infants should eat more frequently with a higher concentration formula that is pre-digested to aid absorption (MacMullen, Dulski, & Blobaum, 2014). In addition to the clinical practice, nurse attitudes also influence patient outcomes.

*Nurse Attitudes Towards the Care of Infants Experiencing NAS & Families*

Investigating nurses’ attitudes toward the care of infants experiencing NAS and their families is important. Nurses may have difficulty showing compassion for the mother who has or is using addictive substances (Murphy-Oikonen et al., 2012).
Research has examined the attitudes of nurses and midwives towards mothers affected by substance abuse and found the attitudes are negative and judgmental (Raeside, 2003). One study showed that the most experienced nursing staff had a more negative attitude than those with less neonatal experience (Raeside, 2003). This negative attitude may be attributed to caregiver burnout (Murphy-Oikonen et al., 2009; Romisher, et al., 2018; Tobin, 2018). Though nurses may not intentionally stigmatize infants with NAS or the mothers, a population prejudice and ethical burden may cause this behavior to occur (Cleveland & Bonugli, 2014).

Not only nurses reported their own negative attitudes, but also many mothers with addiction felt judgement and bias from nurses, guilt and shame, and also felt unwelcome at the bedside or excluded from care (Cleveland & Gill, 2013; Johnson, 2017). Mothers may not understand what is happening with their babies, how to manage them, or know how to help (Johnson, 2017). Mothers have reported that nurses do not have an appropriate understanding of addiction. Mothers also reported lack of trust in the nursing staff (Cleveland & Bonugli, 2014). Nursing stigma and negative attitudes may push the mother away from the bedside, leaving the infant to withdraw without maternal support (Cleveland & Bonugli, 2014). This issue is particularly concerning given that the presence of the mother or caregiver of the infant with NAS is essential for positive outcomes and treatment. A judgement-free environment may increase the likelihood that the mother will remain at the infant’s bedside. Mothers should be encouraged to room in, feed, console, and bond with the infant. This presence is, at times, further complicated by the mothers’ need for acute addiction care herself. Nurse attitudes and the relationship to clinical care is a complicated issue. Yet, there is evidence that educating nurses can
change their attitudes and increase their clinical knowledge.

_Evidence for Educating Nurses who Care for Infants with NAS_

Evidence shows a clear nurse knowledge gap related to opioid use disorder (OUD) and care of the infant with NAS. Nurses may place blame on the substance-using mother for the infant’s symptoms, feel frustration with the mothers for not being involved with the care of the infant, and feel overwhelmed caring for the infant and the mother’s needs (Romisher et al., 2018). Nurses also report a lack of education or facility guidelines for clinical practice (Romisher et al., 2018). Nurses have reported stress and frustrations when caring for infants with NAS and have also reported strained relationships with parents of their patients (Romisher et al., 2018). Frustration with the lack of nursing education regarding NAS, in general, and how to interact with mothers of infants with NAS was also reported (Tobin, 2018). The lack of knowledge places nurses in a disadvantaged position when care for infants with NAS is necessary. Research shows that hospitals need to improve staff support, implement protocols, and ensure consistency in practice (Loyal et al., 2019).

Formal education may improve nurse knowledge and attitude. One study suggests that changing nurses’ knowledge may also affect their attitudes (Tierney, 2016). Specifically, nurses who lack a good knowledge of the OUD disease-process may mistreat patients who seek help (Tierney, 2016). Current literature indicates the need for nurses to have education regarding caring for the mother-infant dyad, opioid use disorder, and care for infants with NAS (Tobin, 2018). Formal education has been found to increase knowledge and improve attitudes in a second, albeit dated, study (Ludwig et al., 1996). Research suggests that addressing the nurse knowledge deficit is a potential step in
changing nurse attitude toward infants experiencing NAS and their families. Nursing education on applying newer assessment tools and practice methods that have shown improvement to patient outcomes is necessary (Grisham et al., 2019; Sanlorenzo et al., 2018). There is a need to identify the best way to provide education for nurses caring for infants with NAS and their families (Tobin, 2018). Researchers argued that nurses need to be educated to improve care, management, reduce stigma, stereotyping, and increase knowledge of addiction (Tierney, 2016). Improved patient outcomes associated with implementing nonpharmacological methods, such as the *Eat, Sleep, Console Model*, have been successful with the involvement and education of nurses at the bedside (Boedeker & Hope, 2019). Nurses should receive education on best practice techniques to provide high quality care.

**Rationale**

Globally, there is evidence to guide care for infants experiencing NAS; evidence that could be used to create an educational intervention aimed at improving nurses’ knowledge and attitudes and subsequently improve patient outcomes. Yet, changing attitudes and clinical practice are complicated and thus this project used both an implementation and a theoretical framework to create an intervention that is likely to advance and sustain change. Specifically, this quality improvement project used a design thinking process to assess nurse knowledge and attitude, and subsequently design an educational intervention for nurses caring for infants with NAS in a NICU unit in a hospital in southwest VA. In addition to the design thinking methods used as an implementation framework, the Institute for Healthcare Improvement (IHI) Psychology of Change Framework, outlined in the following, was the theoretical guide for the study.
(Hilton & Anderson, 2018).

**Institute for Healthcare Improvement (IHI) Psychology of Change Framework**

The Institute for Healthcare Improvement (IHI) Psychology of Change Framework to Advance and Sustain Improvement (Figure 1) served as the theoretical framework to create change in the practice setting (Hilton & Anderson, 2018). In this framework, the leader works with front-line staff to design change in a meaningful and workable way to meet local needs thus improving staff buy-in and expectations that meaningful change will occur.

The IHI Psychology of Change Framework has five interrelated domains of practice: Unleash Intrinsic Motivation, Co-Design People-Driven Change, Co-Produce in Authentic Relationship, Distribute Power, and Adapt in Action (Hilton & Anderson, 2018). Specifically, in this study, one of the domains, *co-design* was used to activate staff agency such that staff would be more likely to embrace the designed changes. Staff most affected by the change, specifically nurses, were given a meaningful voice in all aspects of the design. Other stakeholders were interviewed in order to gain greater perspective on the consequences of training. This framework allows for a human focus that may improve healthcare and may be sustained over time; thus, it was a good fit with the implementation method, design thinking, a human centered design method (Hilton & Anderson, 2018).
Design Thinking Method

Design thinking is a human-centered design implementation method that iteratively uses the steps empathize, define, ideate, prototype, and test to create a final product (Curedale, 2018; Kelley & Kelley, 2013). Design thinking methodology focused on the needs and preferences of the stakeholders allowing the design team and the stakeholders to co-create the final product, which in this case the final product is an intervention (Curedale, 2018; Kelley & Kelley, 2013). Design thinking methodology fits well with the IHI Psychology of Change framework as design thinking provides practical implementation of co-design ideal outlined in the IHI Psychology of Change framework.
Stakeholders are involved through the entire process, from the needs-assessment to the final implementation of the education project thus stakeholders may be more likely to accept the co-created intervention as a product of their efforts; and the intervention has the potential to thus be expected to work at changing nurse attitude and knowledge.

**Aims**

Thus, the purpose of this project was to assess the educational needs for staff nurses from the NICU working with babies experiencing NAS and to create an educational intervention to meet the nurses’ needs. The specific aims were to:

- **Aim 1**: Describe baseline nurse knowledge and attitude pre-quality improvement project
- **Aim 2**: Describe nurse educational needs and preferences related to clinical care of the baby experiencing NAS based on gained empathy through interviews
- **Aim 3**: Design an educational intervention to meet nurse stakeholder needs and preferences

**Methods**

**Context**

This quality improvement project used the design thinking method (Curradale, 2018) to implement the IHI Psychology of Change (Hilton & Anderson, 2018) ideal of co-design by assessing needs of primary stakeholders, registered nurses (RNs) caring for infants experiencing NAS, and subsequently co-creating an educational intervention. The implementation site was a NICU at a non-profit hospital located in Southwestern, VA. Within the children’s hospital of the facility, there was a pediatric unit, a NICU and a NAS nursery which altogether have approximately 92 beds.
There was a major change to the structure of NAS care directly prior to onset of this project with the opening of a 5-bed bed nursery within the wellborn/newborn nursery, called the “Hugs” nursery. Neonates with NAS were transferred to the Hugs nursery and their care was transferred to mother/baby nurses. Additionally, the model of care was changed to the eat, sleep, console model (Grisham et al., 2019). This model focuses on specific symptoms of NAS, including the infant’s ability to eat appropriately, sleep adequately and be consoled with nonpharmacologic interventions within 10 minutes of crying. RNs working in the NICU, Hugs nursery, and pediatric unit all care for infants with NAS. Additional important context information is covered in the background section in the description of the local problem.

Designing an Intervention

The design-thinking team collaborated at each stage of the process to improve trustworthiness of the results. The team consisted of Rebekah Draper, an experienced registered nurse and DNP student, Milena Staykova, a research investigator in healthcare and academic instruction, and Erica Lewis, an expert in design thinking and nursing research. A design thinking team should include as much diversity as possible (Curedale, 2018). Thus, RNs were included as members of the team as often as possible.

Figure 2

Design Thinking Process
Design thinking (figure 2) was used by the team as the implementation method for development of the intervention. Design thinking follows the steps of empathize, define (the problem), ideate, prototype, and test (Curedale, 2018). The design thinking process is described linearly below. In implementation, design thinking is iterative, not linear, and consistently returns to the empathy step as visualized in figure 2.

**Step 1 Empathize**

Design thinking begins, and iteratively comes back to, gaining empathy for stakeholders. Empathy was gained for the RN stakeholders using both quantitative and also qualitative methods. Interviews allow the design team to observe, listen to, and gain empathy for the stakeholders who will be affected by the intervention (Beaird et al., 2018; Kelley & Kelley, 2013). RNs were interviewed. Next interviews were transcribed using a transcription application and themes were organized using empathy maps (See figure 3). Moreover, empathy maps (figure 3) were used by the design team to draw inferences from the interview data using descriptive methods.

**Figure 3**
Qualitative and quantitative methods are discussed further in the measures section. Information needed to understand the steps of the process is provided here. The primary goal of the interviews was to describe what the participants said and did in the interview and then make inferences based on the participants' thoughts and feelings until saturation was reached.

**Step 2 Define**

In the next step of the design thinking method, the design team defined the needs of the stakeholders by reviewing the themes, both stated and inferenced, gained from the interviews and seen in the survey data result using problem statements. Problem statements are used in the method to define the specific needs of the stakeholders and converge around areas to next brainstorm solutions (Curedale, 2018). The design team defined the problems articulated in the interviews. Additional interviews followed to
validate that the design team had accurately characterized the problems and made appropriate inferences. The team re-defined the problems following interviews.

**Step 3 Ideate**

Once the needs were defined, educational interventions were brainstormed by the design thinking team. In this divergent phase, many ideas for meeting the stakeholder educational needs were considered, as required by the method (Curedale, 2018). The team used brainstorming techniques such as “yes, and” to discover new ideas (Kelley & Kelley, 2013).

**Step 4/5 Prototype/Test**

Two of the brainstormed ideas were prototyped and tested in interviews with participants until they were found by the stakeholder to be useful. Interviews to assess items such as indicators of success, failure, efficiency and cost were planned. The prototyping phase allowed the design thinking team to consider the needs of the user while improving the creation of the educational content intervention.

**Study of the Intervention**

This first step, described in this document, in an ongoing program of scholarship; it is the study of rigorous intervention creation, which includes the iterative study of the intervention as it is created. The design thinking method allows for real-time feedback and creation of an intervention based on rigorous process. For example, iterative validating, that is part of the design thinking method, is an approach used to establish that the created intervention is useful and increase the likelihood that outcomes will be related to the intervention when implemented (Curedale, 2018). Based on the IHI Psychology of Change theory, it is likely that the intervention, once implemented, will be effective
because the stakeholders helped create the education with their needs in mind from the start (Hilton & Anderson, 2018).

Survey data and interview themes were the approaches used to identify trends and themes to gauge the potential impact of the intervention as it was being created. Outcomes assessment was not part of this initial scholarship step.

**Survey Methods**

An online survey was used to gather quantitative data. The survey was done at the beginning of the study to better understand participant needs. The survey used the institution’s RedCAP (Research Electronic Data Capture) (Harris et al., 2019) software to deploy the survey and their health analytics research team to assist with the design the survey, collect, and store the data. The survey was originally built by Romisher, Hill, and Cong in 2018. Permission was granted for the duplication of this survey by the authors.

**Sample**

All RNs who provide care to infants with NAS in the NICU were recruited to participate. Inclusion criteria was, RNs who worked in the NICU and who provided direct patient care to infants or influenced such care. No discrimination was based on their gender, age, educational level, and background. A convenience sample allowed for inclusion of as many participants as possible. All 111 RN staff were strategically recruited to participate in an attempt to reduce selection bias. For recruitment, informational flyers were posted in the unit and RNs were sent a recruitment email that included the survey link for participation. The final survey question allowed survey participants to volunteered to be interviewed. A follow-up email to arrange an interview was sent to 3 RNs who volunteered at survey end. Fifteen additional nurses were
developed by email using snowball techniques throughout the process in an attempt to increase participation numbers. Efforts to reduce selection bias occurred as interview dates and times were announced to all RNs in advance with multiple opportunities occurring on various shifts and days to include as many participants as possible. Interviews were planned to be completed until saturation was reached at each step (Krippendorff, 2019). The following measures are an important part of the study of the intervention creation.

**Qualitative methods**

Historically, design thinking has characterized these methods as ethnographic (Curedale, 2018). In practice, design thinking methods follow qualitative descriptive methods with undertones of ethnography and narrative inquiry as described by Sandelowski (2001) who argues that qualitative methods are too often characterized as being more in-depth than they actually are; therefore, caution should be exercised not to confuse qualitative descriptive methods with undertones of another method, such as ethnography, with the more sophisticated method itself (Sandelowski, 2001).

**Measures**

**Quantitative**

As part the understanding stakeholders needs (empathize) the NAS survey tool, a copy of which is in Appendix A, was administered (Romisher et al., 2018). The survey owner provided written permission for its use. To summarize, the NAS survey tool is composed of a set of demographic information, assessment of nursing attitudes, assessment of knowledge regarding care of infants with NAS, and nurses’ perceptions regarding clinical practice. More specifically, the demographic information assesses the
gender of the participant, ethnicity, race, age group, the educational degree, the nursing role, and the workplace setting. The attitude section assesses opinions and attitudes related to the care environment, blaming mothers for NAS, dealing with mothers, mother’s substance abuse, difficulty of caring for infants with NAS, mother’s presence at the bedside, and family centered care. This section is composed of seven questions. The seven question-knowledge section assesses general knowledge perception of care for infants with NAS, documentation of care, training, pharmacological treatment, addiction, and outpatient treatment for NAS.

The perceptions section, composed of six questions, assesses the nurse’s practice regarding use of nonpharmacological interventions, scoring tools, accuracy and objectivity of scoring, advocacy of breastfeeding, unit-protocols appropriateness for care and environment. These questions measure attitudes, knowledge, and perceptions based on a Likert scale ranging from strongly disagree to strongly agree. A case study is also included in the survey tool with the intent of directly measuring the nurse’s knowledge. The NAS survey tool has been used previously and has face validity. The tool was used in only one study with a similar sample (Romisher et al., 2018).

**Qualitative**

Methods of gathering and interpreting qualitative data and rationale for use are described in other sections. In this section, questions used are described. Validity and reliability are not relevant to qualitative data. Although, trustworthiness of data findings was enhanced by validating themes with stakeholders and by all team members reviewing and contributing to thematic development and brainstorming. Participant interview
questions varied depending on the exact stakeholder and the timing of the interview as questions evolved from the beginning to the end of the process.

Some example questions from the beginning of the process were:

1) I’m grateful for your time today, what about this design exercise interested you enough to spend time talking to me?

2) What is it like caring for babies with NAS on this unit?

3) What is challenging about caring for infants with NAS on the unit?

4) Are you familiar with any treatment protocols for care of infants with NAS?

5) If you received any orientation or education to care for infants with NAS, what was that like?

6) Do you have a preference regarding the format/delivery method of training and education? What format has worked for you in the past? What has not worked?

7) What are some potential areas for confusion for staff regarding infants with NAS?

8) Do you use an assessment tool to determine the symptoms of withdrawal for the infant with NAS? If so, which assessment tool(s) are you familiar with using? How do you feel about your ability to use the assessment tool?

9) What are the opportunities for improvement in nurse attitude when it comes to moms who have a baby experiencing NAS?

Some example questions from the end of the process to the nurse were:
1) I have an outline of an education I would like to provide to the nurses working in the NICU, would you look at it?

2) What parts of this interest you most?

3) Are there areas that are confusing in this outline?

**Ongoing Assessment**

Design thinking methodology allows for understanding the needs of the participants (Kelley & Kelley, 2013). Empathy maps were used to draw inferences about the elements that contribute to potential attitude and judgment because they consider the emotional ties that affect the human-being. With use of best-practice recommendations and allowance for the needs of the user, the design education was more likely to be successful.

Success of this project was determined based on whether the specific aims were met. The design thinking team was attuned to contextual elements contributing to the success and failure as they interpreted the interview themes and looked at the trends. There was no cost associated with the specific aims of this project.

**Data Accuracy**

Consideration for what the users did, said, thought, and felt when interviewing and observing the participants (Gibbons, 2016). Accurate participant perspectives were ensured of the participants by validating assumptions with further interviews by using the empathy step in the design thinking process. The team defined the data by gathering the learned information, and further organized the data by considering parallels and common topics to identify the specific needs of the participants. The team used data from the initial interviews and pre-survey data to collect information to identify participant
educational needs. After these needs were defined, the team ideated creative ways to present the education to the nurses to address their unmet needs (Gibbons, 2016). Then a prototype of the education was formed and presented it to the participants which allowed for continued feedback and transformation of the prototype through testing. This step helped to ensure validation if the intervention met the nurses’ needs.

To ensure completeness and accuracy of the data, participants created a unique identification code during the survey process that was user-specific and allowed for separation of data and de-identification of each specific user. The data was stored through a secure electronic server. The interviews were recorded using transcription software and the user’s voice recordings were immediately deleted to ensure accuracy of the transcript and de-identify the specific nurses with their voices. Themes and trends were identified by the design team verified with the participants to ensure trustworthiness of the data, especially credibility, dependability, and conformality. All data was stored in a secure location, an encrypted storage platform on the primary investigator’s work computer.

Analysis

Quantitative Data

Microsoft Excel was used to organize and analyze survey data. Descriptive statistics such as means and standard deviations were calculated to better understand the participant's baseline knowledge and attitudes. Use of qualitative data is further described in the next section as analysis of the two was integrated.

Qualitative data

Interviews were transcribed using the Temi-Record and Transcribe (2020) application and then organized using empathy maps as they were completed with each
round of interviews, members of the team each created an empathy map for each
interviewee. Then, together, the team reviewed all created empathy maps and quantitative
data to identify themes. Next, the team reframed the teams using problem statements.
Inferences were used to define problems thus the problem statements were next verified
with the participating NICU nurses. The design thinking team brainstormed solutions to
the defined problems. Brainstormed solutions included participants in that process.
Solutions were made into visible prototypes and tested with the participants.

Variation

Variation within the data may have occurred because multiple stakeholders were
interviewed, and their perspectives differed. This variation of data is considered to be an
advantage in this project as greater participation and variety lead to less selection bias.
The analysis of the data for trends and observations for commonalities to ensure the
project fit the majority of those interviewed. The analysis was a rapid-cycling process and
time was not a factor that caused variation in the data. The period of time for
interviewing, prototyping and testing was relatively short overall, lasting two months.

Ethical Considerations

The proposal was approved by James Madison University and the local hospital’s
Investigational Review Boards before beginning the project (IRB Number: IRB-19-570).
Written permission to use premises and recruit participants was obtained from the senior
directors of women and pediatric services. Buy-in from senior directors was secured. Due
to low self-enrollment in phase 2, the primary investigator contacted both of the
collaborating IRBs to obtain permission to recruit participants face-to-face or by email.
Permission was granted. Institutional review board (IRB) approval was secured before
research began from the participating institution and from James Madison University. This project was determined by both IRBs to be exempt from review. There were no potential conflicts of interest by the primary investigator or anyone on the team. The participants in this research project were registered staff nurses who work with infants in the NICU who have been diagnosed with neonatal abstinence syndrome. Because of the potentially sensitive nature of the survey results, including potentially revealing deficits in nurse knowledge and nurse attitude, individual results were kept confidential. Participants were de-identified from direct identifiers during the survey process by utilization of a unique code and all results were presented in aggregate form. Additionally, specific descriptive information was not obtained during the survey to keep the identities of the participants confidential. The name of the institution will also be kept confidential in any published reports of the findings. All data was kept in a secure fashion online, described above. Written notes were kept in a locked file cabinet in the primary investigator’s office.

Participation was voluntary and participants were counseled with informed consent that included risks and benefits. Participants were not asked to participate in the project by management and were not coerced into participation of the project by management in any way. Participants were emailed with the survey and project information and signed up for the participation voluntarily either electronically or in-person. Then, those who agreed to participate were interviewed individually.

Results

**Phase 1: Survey for Baseline Attitude, Knowledge, and Practice**

*Survey Results*
There were 15 participants who responded to all quantitative survey questions for a response rate of 13.5%. The participants in this survey were RNs working in the NICU with varying levels of education and experience. Additional demographics were not collected to protect participant privacy. Attitudes, knowledge, and clinical practice were assessed. Also, participant knowledge is directly measured in a case study.

This section reports findings on attitudes regarding care of the infant with NAS. In this section, those who selected agree or strongly agree are considered together as agreeing with the idea and those who selected disagree or strongly disagree are considered together, however specific numbers and percentages of item responses can be found in Table 1.

Participants showed an attitude of generosity and care for infants with NAS. Many of the participants (47%) believed that infants with NAS should be cared for in a critical care environment such as the NICU. The majority (74%) of participants felt the rewards of caring for an infant with NAS outweighed the challenges.

Attitudes towards mothers were more negative. Many of the participants (47%) reported that that they frequently place blame on the mother of an infant with NAS for the infant’s health problems. More participants failed to consider potential circumstances surrounding the mother’s drug use (47%) than consider it (20%) or were neutral to the idea (33%). Most of the participants (53%) felt frustration if the mother was infrequently present to provide care to the infant. Further, excluding those who were neutral to the idea, participants were equally divided in feeling responsibility to provide any care for the mother of an infant. Despite this, only 20% found caring for infants and mothers to be stressful, perhaps because infants were included in the statement.
# Table 1

Participant Attitudes regarding care of infants with NAS

<table>
<thead>
<tr>
<th>Description</th>
<th>SD n (%)</th>
<th>D n (%)</th>
<th>N n (%)</th>
<th>A n (%)</th>
<th>SA n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe that infants with NAS should be cared for in a critical care environment such as the NICU.</td>
<td>3 (20)</td>
<td>3 (20)</td>
<td>2 (13)</td>
<td>3 (20)</td>
<td>4 (27)</td>
<td>3.13</td>
<td>1.55</td>
</tr>
<tr>
<td>I frequently blame the mother of an infant with NAS for the infant's health problems.</td>
<td>1 (7)</td>
<td>2 (13)</td>
<td>5 (33)</td>
<td>6 (40)</td>
<td>1 (7)</td>
<td>3.27</td>
<td>1.03</td>
</tr>
<tr>
<td>I find dealing with mothers of infants with NAS to be stressful or upsetting.</td>
<td>1 (7)</td>
<td>6 (40)</td>
<td>5 (33)</td>
<td>3 (20)</td>
<td>0 (0)</td>
<td>2.67</td>
<td>0.90</td>
</tr>
<tr>
<td>When interacting with a mother of an infant with NAS, I consider the potential circumstances surrounding her drug use.</td>
<td>1 (7)</td>
<td>6 (40)</td>
<td>5 (33)</td>
<td>3 (20)</td>
<td>0 (0)</td>
<td>3.60</td>
<td>0.99</td>
</tr>
<tr>
<td>I feel that the rewards of caring for an infant with NAS outweigh the challenges of caring for an infant with NAS.</td>
<td>0 (0)</td>
<td>1 (7)</td>
<td>3 (20)</td>
<td>7 (47)</td>
<td>4 (27)</td>
<td>3.93</td>
<td>0.88</td>
</tr>
<tr>
<td>I find it frustrating when the mother of an infant with NAS is infrequently present to provide care for her infant.</td>
<td>0 (0)</td>
<td>4 (27)</td>
<td>3 (20)</td>
<td>6 (40)</td>
<td>2 (13)</td>
<td>3.40</td>
<td>1.10</td>
</tr>
<tr>
<td>I believe that I am responsible for caring for the mother of an infant with NAS as well as the infant.</td>
<td>1 (7)</td>
<td>5 (33)</td>
<td>3 (20)</td>
<td>5 (33)</td>
<td>1 (7)</td>
<td>3.00</td>
<td>1.13</td>
</tr>
</tbody>
</table>

Note: SD-standard deviation, n-sample size, SD - Strongly disagree, D - Disagree, N - Neither agree nor disagree, A - Agree, SA - Strongly agree
This section reports findings on RN knowledge regarding care of the infant with NAS. In this section, those who selected agree or strongly agree were considered together as agreeing with the idea and those who selected disagree or strongly disagree were considered together, however specific numbers and percentages of item responses can be found in Table 2.

Participants were confident in their knowledge of care in general. Fully 93% of participants felt they have enough knowledge about NAS to provide adequate care for affected infants with NAS and 7% chose neither agree or disagree. Despite this, when it came to the specifics, the results of participant perceptions of knowledge were more mixed and knowledge deficits were identified. Participants were most confident of care of the infant in the hospital setting, yet variation occurred even within these items. While 93% of participants felt they had sufficient knowledge of commonly used drugs in treating NAS to safely administer them, less (67%) of nurses knew how to appropriately document the care they provided to an infant with NAS. Similarly, 60% felt that they have adequate knowledge about various maintenance/pain medications and their effects on the newborn infant. More than half of the nurses (53%) reported that they did not receive adequate training on the use of assessment tools used with infants with NAS.

Participants were less confident about dealing with mothers and in-home care of the patient. When asked if the participants felt that they had enough knowledge about addiction to appropriately deal with mothers of infants, less than half of participants (47%) agreed. Some participants felt that more training was needed. The majority of the participants (60%) felt they did not have enough knowledge about in-home or outpatient treatment of infants with NAS.
**Table 2**

*Participant Knowledge regarding care of infants with NAS*

<table>
<thead>
<tr>
<th>Statement</th>
<th>SD n (%)</th>
<th>D n (%)</th>
<th>N n (%)</th>
<th>A n (%)</th>
<th>SA n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel that I have enough knowledge about NAS to provide adequate care for affected infants.</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (7)</td>
<td>9 (60)</td>
<td>5 (33)</td>
<td>4.27</td>
<td>0.59</td>
</tr>
<tr>
<td>I know how to appropriately document the care I provide to an infant with NAS.</td>
<td>0 (0)</td>
<td>3 (20)</td>
<td>2 (13)</td>
<td>6 (40)</td>
<td>4 (27)</td>
<td>3.73</td>
<td>1.10</td>
</tr>
<tr>
<td>I have received adequate training on the use of assessment tools used with infants with NAS.</td>
<td>0 (0)</td>
<td>8 (53)</td>
<td>2 (13)</td>
<td>2 (13)</td>
<td>3 (20)</td>
<td>3.00</td>
<td>1.25</td>
</tr>
<tr>
<td>I have adequate knowledge about various maintenance/pain medications and their effects on the newborn infant.</td>
<td>0 (0)</td>
<td>3 (20)</td>
<td>3 (20)</td>
<td>6 (40)</td>
<td>3 (20)</td>
<td>3.60</td>
<td>1.06</td>
</tr>
<tr>
<td>I feel that I am knowledgeable enough about commonly used drugs in treating NAS to safely administer them.</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (7)</td>
<td>10 (67)</td>
<td>4 (27)</td>
<td>4.20</td>
<td>0.56</td>
</tr>
<tr>
<td>I feel that I have enough knowledge about addiction to appropriately deal with mothers of infants with NAS.</td>
<td>1 (7)</td>
<td>3 (20)</td>
<td>4 (27)</td>
<td>4 (27)</td>
<td>3 (20)</td>
<td>3.33</td>
<td>1.23</td>
</tr>
<tr>
<td>I am knowledgeable about in-home or outpatient treatment of infants with NAS.</td>
<td>1 (7)</td>
<td>8 (53)</td>
<td>1 (7)</td>
<td>4 (27)</td>
<td>1 (7)</td>
<td>2.73</td>
<td>1.16</td>
</tr>
</tbody>
</table>

*Note.* SD-standard deviation, n-sample size. SD - Strongly disagree, D - Disagree, N - Neither agree nor disagree, A - Agree, SA - Strongly agree.
This section reports findings on RN perceptions regarding clinical practice in NAS care. In this section, those who selected agree or strongly agree were considered together as agreeing with the idea and those who selected disagree or strongly disagree were considered together, however specific numbers and percentages of item responses can be found in Table 3. All of the participants (100%) reported they frequently used nonpharmacological interventions when caring for a baby with NAS. Most of the RNs (80%) used a scoring tool to frequently assess infants with NAS and 20% were neutral to the idea. Most (87%) also reported that the score they assigned to an infant with NAS was accurate and objective. Advocacy for breastfeeding was inconsistent, with more participants than not (46%) reporting that they would advocate for breastfeeding. Participants also varied in their opinion of the care provided on the unit. When asked if the participants believed their unit has developed adequate practice protocols in caring for infants with NAS and their families, 53% agreed, 27% were neutral, and 20% disagreed. Most of the participants (66%) felt that the unit has created an appropriate environment/facility to care for infants with NAS and their families.
**Table 3**

*Participant Perceptions regarding clinical practice in NAS care*

<table>
<thead>
<tr>
<th>Perception</th>
<th>SD n (%)</th>
<th>D n (%)</th>
<th>N n (%)</th>
<th>A n (%)</th>
<th>SA n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>I frequently use nonpharmacological interventions when caring for a baby with NAS.</td>
<td>0 ( 0)</td>
<td>0 ( 0)</td>
<td>0 ( 0)</td>
<td>7 (47)</td>
<td>8 (53)</td>
<td>4.53</td>
<td>0.52</td>
</tr>
<tr>
<td>I score infants with NAS frequently using the Finnegan Scale or another tool.</td>
<td>0 ( 0)</td>
<td>0 ( 0)</td>
<td>3 (20)</td>
<td>6 (40)</td>
<td>6 (40)</td>
<td>4.20</td>
<td>0.77</td>
</tr>
<tr>
<td>The score I assign to an infant with NAS is accurate and objective.</td>
<td>0 ( 0)</td>
<td>1 ( 7)</td>
<td>1 ( 7)</td>
<td>6 (40)</td>
<td>7 (47)</td>
<td>4.27</td>
<td>0.88</td>
</tr>
<tr>
<td>I advocate for mothers of infants with NAS to breastfeed their infants.</td>
<td>0 ( 0)</td>
<td>3 (20)</td>
<td>6 (40)</td>
<td>5 (33)</td>
<td>2 (13)</td>
<td>3.47</td>
<td>0.92</td>
</tr>
<tr>
<td>I believe that my unit has developed adequate practice protocols in caring for infants with NAS and their families.</td>
<td>0 ( 0)</td>
<td>3 (20)</td>
<td>4 (27)</td>
<td>6 (40)</td>
<td>2 (13)</td>
<td>3.47</td>
<td>0.99</td>
</tr>
<tr>
<td>I feel that my unit has created an appropriate environment/facility to care for infants with NAS and their families.</td>
<td>0 ( 0)</td>
<td>3 (20)</td>
<td>2 (13)</td>
<td>8 (53)</td>
<td>2 (13)</td>
<td>3.60</td>
<td>0.99</td>
</tr>
</tbody>
</table>

*Note:* SD-standard deviation, n-sample size. SD - Strongly disagree, D - Disagree, N - Neither agree nor disagree, A - Agree, SA - Strongly agree

This section reports findings from the survey case study where participants were given a case to review and make decisions for assessment, scoring, and choose
appropriate interventions for treatment. Most participants correctly identified signs and symptoms of withdrawal with needed improvement in identification of signs and symptoms in jitteriness, sleeping patterns, and mottling. Many of the participants correctly selected intervention modalities with need for improvement in swaddling, morphine therapy, vertical rocking, and decreased stimulation. See Table 4 for details.
Table 4

Summary Report of the Case Study (n = 15)

<table>
<thead>
<tr>
<th></th>
<th>Number of correct answers (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Which of the following symptoms would you expect to see in an infant going through withdrawal from methadone? (all answers are correct)</strong></td>
<td></td>
</tr>
<tr>
<td>Jitteriness</td>
<td>15 (100)</td>
</tr>
<tr>
<td>Increased sleeping</td>
<td>14 (93)</td>
</tr>
<tr>
<td>Increased alertness</td>
<td>7 (47)</td>
</tr>
<tr>
<td>Feeding Difficulties</td>
<td>15 (100)</td>
</tr>
<tr>
<td>High-pitched cry</td>
<td>14 (93)</td>
</tr>
<tr>
<td>Mottling</td>
<td>13 (87)</td>
</tr>
<tr>
<td>Sneezing</td>
<td>15 (100)</td>
</tr>
<tr>
<td>Excoriation of skin</td>
<td>15 (100)</td>
</tr>
<tr>
<td>Score of 8 to start treatment</td>
<td>11 (73)</td>
</tr>
<tr>
<td><strong>Interventions (All answers are correct)</strong></td>
<td></td>
</tr>
<tr>
<td>Swaddling</td>
<td>14 (93)</td>
</tr>
<tr>
<td>Morphine therapy</td>
<td>12 (80)</td>
</tr>
<tr>
<td>Vertical rocking</td>
<td>12 (80)</td>
</tr>
<tr>
<td>Decreased stimulation</td>
<td>14 (93)</td>
</tr>
<tr>
<td>Intravenous fluids</td>
<td>1 (7)</td>
</tr>
</tbody>
</table>

*Note: n-number of correct answers*
Interview Results

One person was interviewed as part of a first round of interviews. Each team member created an empathy map example (See example empathy map in Figure 4).

Figure 4

Empathy Map Example

Themes from that interview and from the quantitative survey data were next organized into the following problem statements by the team.
1. Staff RNs need innovative ways to maintain excellent care for babies with NAS despite infrequent contact.

2. It would be game changing if all staff RNs viewed families of NAS babies as worthy members of the care team.

3. It would be game changing in the care of NAS babies if community stigma towards those with addiction changed.

4. New graduate nurses need systematic training to be proud of the care they deliver to babies experiencing neonatal abstinence syndrome.

In addition to these themes, an important change in the unit context was identified during the round 1 interview. To describe this change, the organization opened a new transitional care nursery within the mother/baby unit and implemented a new model of care for infants with NAS. The NICU leadership, physicians, and nurses turned over care of this population to Women’s and Children’s Services leadership, physicians, and nurses. At the conception of this quality improvement project, the Finnegan Neonatal Abstinence scoring system and the care model related to it were in practice at the organizational site (Delvin et al, 2017).

This new model of care would allow the organization to no longer focus on pharmacologic weaning of opioids as the care model and would focus on nonpharmacological treatment modalities. One of the interventions heavily utilized in this model was holding and consoling the infant; the motivation for naming the nursery was “Hugs not Drugs” and shortened to “Hugs”. When an infant was unable to be “captured” with the eat, sleep, console interventions, then the patient would be transferred to the NICU for invasive monitoring and treatment with medication. The new care model
changed the number of infants treated, length of stay, and overall census and staff volume in the units. The interest of the NICU nurses changed as a result. Thus, the needs were identified as different than expected for the educational intervention.

**Phase 2: Problem Definition (Results related to aim 3)**

Five participants were interviewed in a second round of interviews. Interview questions were similar to the first round but included gathering feedback of the problem statements proposed in round 1. Each team member reviewed the interviews and created an empathy map for this round of interviews.

Next the team together suggested changes to the problem statements. At the end of round 2 of interviews the problem statements were refined to be as follows:

1. **Staff RNs need innovative ways to maintain excellent care for babies with NAS despite infrequent contact.** (This encompasses knowledge, skills, attitudes)

2. **It would be game changing if all staff RNs and families of NAS babies shared a vision for care of the baby.**

3. **Nurses need support to maintain empathy towards mothers of NAS babies.**

4. **It would be game changing if systems factors supported timely and effective ESC implementation.**

5. **New graduate nurses need systematic training to be proud of the care they deliver to babies experiencing neonatal abstinence syndrome.**

After problem statements were created, the team converged around 1 specific problem to address, which was **Staff RNs need innovative ways to maintain excellent care for babies with NAS despite infrequent contact.** All team members agreed about selecting this problem statement. The rationale for selecting it was because this problem was
significant and all nurses on the unit, those who required initial training and education as well as those who require continuing education and competency would both benefit from the training. Other problems were also important. The initial focus before changing attitudes and collaborating with families would need to be baseline knowledge and education. Once RNs knew more, hopefully they may change their perspectives. Systems factors were not a realistic goal for change in this project. Finally, the chosen problem statement allowed the researchers to meet the aims of the project.

**Phase 3: Brainstorming & Prototype Creation (Findings related to aim 3)**

Next the design thinking team together brainstormed multiple options for addressing the problem that *staff RNs need innovative ways to maintain excellent care for babies with NAS despite infrequent contact*. Table 5 lists many of the brainstormed solutions. Solutions considered were creating an orientation/shadowing program, utilization of an application to open for just in time education, pamphlet, algorithm, education binders with hugs training and protocol with a NAS RN champion who updates the binder, simulation training, peer led training when a RN is assigned a NAS patient, NAS RN champion on the unit to train at the bedside or offer support, hold a nursing conference on NAS, real case patient/family testimonials, offering video training as part of the clinical guidelines, an educational intervention in the form of a poster or oral presentation, and “just-in-time” posted guidelines at the bedside.
Table 5

*Examples from design thinking brainstorm*

<table>
<thead>
<tr>
<th>Education/training Brainstorm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation/shadow</td>
</tr>
<tr>
<td>Video training</td>
</tr>
<tr>
<td>Posters</td>
</tr>
<tr>
<td>Posted guidelines</td>
</tr>
<tr>
<td>Oral presentation</td>
</tr>
<tr>
<td>Application for just in time education</td>
</tr>
<tr>
<td>Pamphlet</td>
</tr>
<tr>
<td>Algorithm</td>
</tr>
<tr>
<td>Education binders</td>
</tr>
<tr>
<td>Simulation training</td>
</tr>
<tr>
<td>NAS RN champion</td>
</tr>
<tr>
<td>Nursing conference on NAS with real case patient/family testimonials</td>
</tr>
</tbody>
</table>

*Note:* Education/training determined direction of this QI project

Two of the brainstormed solutions were chosen by the design thinking team for prototyping, just in time video training and an orientation/shadowing program. Considerations included feasibility and specific participant needs based on the interviews and survey data. Prototypes were developed for two solutions to the problem. Prototypes are visual representations of a solution.

Prototype 1 was a 4-minute, “just-in-time” video, meaning that it was proposed to be available for viewing directly prior to providing care. The first version of this
prototype included a script. An outline of the script can be found in Figure 5. The video viewing process was structured so that it could be easily accessed by the nursing staff for an on-demand education when caring for an infant with NAS. This prototype was structured to meet knowledge and attitude deficits needs while also recognizing the important context change that RNs in the NICU were providing care infrequently for infants with NAS. Thus, while care of the NAS infant was less “on the mind” of participants, the need for education when providing care was likely going to be higher than previously when RNs consistently provided care. Instead of training in advance of care, the “just-in-time” format with an accessible video allowed RNs to access the information at any point when it was needed directly prior to providing care. Thus, RNs could be offered important reminders prior to care without needing to do additional prior training which felt unnecessary to them given the marked decrease in the number of instances they were asked to provide such care given the formation of the new Hugs nursery.
Prototype 2 was a one-on-one orientation experience with a nurse from the Wellborn Transitional Care “Hugs” nursery for one nursing shift. The process for that is visualized in Figure 5. This prototype met the RNs need to have actual contact with an infant with NAS and would give them an opportunity to observe, practice skills, and ask questions to better understand needs of an infant. This prototype met the needs for training despite the lower incidence of care provided. Moreover, NICU RNs were curious about the Hugs nursery. Many survey participants felt that infants experiencing NAS should be cared for in the NICU. This observational experience would allow RNs from the NICU to have a better understanding of the care provided in the Hugs nursery.

According to RN preferences, the orientation would be offered as an option. A pre-training presentation would occur and then the nurse would spend a shift with a Hugs nursery RN. The RNs recognized the importance to receive credit for the training.
Phase 4: Prototype Testing & Development (Results related to aim 3)

Five additional participant interviews were completed using end-of-project interview questions. Prototype 1 and 2 were viewed by each participant during the interview to gain feedback of the prototypes and deepen understanding of RN stakeholder needs. Themes of interviews were collated by the design thinking team. The interviews were productive at identifying strengths and weakness of each of the two prototypes.

For prototype 1, the RN feedback was overall positive. RNs reported that the just-in-time video training was an excellent way to learn and refresh their knowledge in an on-demand format. However, participants expressed concern that the video did not provide a hands-on learning opportunity for practice. Suggestions included the addition of case studies with practice questions to the video and an addition of a caregiver question and answer session with scripting.
For prototype 2, the Hugs nursery orientation program, several barriers to implementation were identified. Both cost and time were identified by participants as potential barriers to implementation. More specifically participants pointed out that because staffing and budget may be a problem, it may not be feasible to pay RNs to orient for a shift on another unit. Likewise, the difference in care model delivery between the NICU and the Hugs nursery was identified as a potential consideration to nurses being able to take the information they learned in the Hugs nursery back to their work in the NICU. Specific differences included environment, therapeutic options for care, acuity of the patient. Strengths of the Hugs nursery experience included that it was hands-on and fun. RNs really liked the idea of being able to have a hands-on approach to learning. Many felt that the in-person training would allow them to practice care with the ability to ask questions and form relationships with colleagues through support and guidance.

**Discussion**

**Recommendations**

Regarding RN baseline knowledge and attitude, overall RNs showed empathy towards infants experiencing NAS. RNs felt NAS babies should receive a high level of specialized care. Interestingly, despite a large number of nurses feeling that these babies should be cared for in the NICU, the hospital had just moved care of the infants out of the NICU to the Hugs nursery. Alternatively, the creation of the Hugs nursery strengthened NICU RN opinion about location of care. By contrast, in a 2018 survey of RNs implementing the NAS survey tool, only 40% of the RNs in that sample felt that infants with NAS should be cared for in a critical care environment (Romisher et al. 2018). The
current research suggested more variability than previously known about RNs opinions regarding the best unit to provide care for infants experiencing NAS.

In the current sample, RNs felt the benefits of caring for infants with NAS outweighed the challenges. Attitudes towards the mother were less empathetic. RNs placed blame on the mothers for the infant’s health problems related to NAS. Nurses were frustrated when mothers were absent from the infant’s bedside and preferred them to be present during infant’s care. Yet, some RNs considered the responsibility to care for the mother of the patient with NAS in addition to the infant with NAS. This finding affirms previous study findings as the results related to RNs attitude toward mothers, placing blame, and feeling responsible with caring for the mother were similar in a prior research (Romisher et al., 2018). This observation indicated that attitudes towards mothers were consistently an issue among RNs providing care to infants experiencing NAS both in the localized setting and likely in other settings.

Regarding participant knowledge, most of the participants were confident in their knowledge to provide adequate care for infants with NAS. This finding was also true in another study using the same survey instrument (Romisher et al., 2018). There was more variability within the specifics. In that study, there was a self-identified need for improvement in both knowledge of NAS, care of infants, and documentation for some nurses. Areas for improvement were also related to medications used for treatment for infants with NAS and knowledge of addiction relating to mothers of infants with NAS. The previous study demonstrated 31.5% disagreement among participants that they had enough knowledge about addiction to provide appropriate care for the mothers (Romisher et al., 2018).
RNs in the current sample were unfamiliar with outpatient or in-home treatment for infants with NAS, which may significantly cause problems with correct discharge teaching from inpatient to the home setting. The same was true in another study where 75% of respondents reported a lack of knowledge regarding outpatient treatment (Romisher et al., 2018). Thus, this study supported prior findings that while RNs rate their overall knowledge related to care of the infant experiencing NAS well, there were specific areas of self-assessed knowledge deficit.

There were both strengths and areas for improvement identified by the clinical practice questions. Appropriate for the care of infants with NAS, all of the nurses reported the use of nonpharmacological interventions in practice for infants with NAS, but wanted more training on the detailed interventions. In a study by Romisher, Hill, and Cong (2018), the majority of RNs (98%) also reported using non-pharmacological treatments. In both, this sample and the prior one, most nurses used a scoring tool and felt that it was accurate and objective (Romisher et al., 2018).

Many of the nurses advocated for mothers of infants with NAS to breastfeed, but some were uncertain if they should or should not advocate for breastfeeding. While most of the nurses felt the unit had developed appropriate protocols for care of infants with NAS, some felt that there was a need for improvement of these protocols. Likewise, some of the RNs felt that the unit did not create an appropriate environment in the facility to care for infants with NAS and their families. The nurses correctly identified symptoms and treatment for NAS. In another study, only 48% of respondents reported appropriate facility practice guidelines and 33% felt that the environment within their facility was appropriate created for infants with NAS and their families (Romisher et al., 2018).
Others have identified that RNs who provide care to infants experiencing NAS have specific areas of educational need (Tobin, 2018). Therefore, a recommendation should be made that the organization implement and assess the proposed interventions to address these specific knowledge deficits.

Empathy was gained through interviews regarding the description of nurse educational needs and preferences related to care of the baby experiencing NAS. There were two rounds of interviews prior to prototype creation and one round of interviews after. The interviews illustrated that there were thematic problems in the needs for NICU RNs caring for infants experiencing NAS. The themes in our sample supported the needs identified in the literature previously as well a novel theme was identified. Others have found that sigma towards those with addiction was a problem. Similarly, care of families of NAS babies was a known area of tension for the RNs who provided care for that population (Murphy-Oikonen et al., 2012; Raeside, 2003). Research concluded that new graduate RNs needed additional training to provide adequate care in the NICU setting and specifically of babies experiencing NAS.

Findings from this work add that infrequent contact with NAS babies creates a unique problem. For example, RNs need to maintain skills to provide care when it is needed but feel less obligated, and have less opportunities, to do so. Additional interventions may be needed in the localized setting to meet the needs identified in this assessment that were not addressed in the prototypes. Therefore, the results from this project demonstrate meeting aims 1 and 2.

Aim 3 focused on designing an educational intervention to meet nurse stakeholder needs and preferences. Two prototypes aimed at addressing the specific problem “that
staff RNs need innovative ways to maintain excellent care for babies with NAS despite infrequent contact” were tested, evaluated, and updated based on completion of the final round of nurse interviews. The final step in this project was to further test the educational intervention prototypes by obtaining feedback in additional interviews from the nursing leadership. Though the prototype was provided to leadership, feedback was not received due to changes related to COVID-19.

Novel information was gained through this process. First, it was identified that RNs who provide care to infants experiencing NAS were energized by the idea of learning more about such care in a hands-on way. Moreover, RNs were also enthusiastic about educational interventions that were provided when the information was needed. These findings were specific to the localized setting and should be tested with other groups of RNs who provided care to infants experiencing NAS before implementation in a wide-spread fashion.

Additional testing is needed of the proposed interventions to determine if they will be successful in the localized setting. The likelihood is high that the proposed interventions will be successful given the co-design process. The project team recommends the prototyped interventions be further assessed for feasibility related to potential barriers and then the prototype to be implemented in the local setting. Unfortunately, the identified in this project barriers could not be further assessed due to COVID-19 and clinical suspension for nonessential procedures and activities.

**Facilitators, Barriers & Limitations**

One of the facilitating factors for this project was the current need of the population at the organizational site and within the local community with a large number
of substance exposed infants. The RNs currently caring for the NAS population were great facilitators for the implementation of this project. The senior leadership supported the project, allowed the conduct of the survey and interviews, and facilitated collaboration with the NICU staff.

There was a major change to the structure of care directly prior to the onset of this project. The change was related to the opening of the Hugs nursery. An unintended consequence was that the team learned about the ability of the design thinking method to be flexible in an evolving clinical context. While this was a major barrier to the planned work, a strength of the design thinking method was that with the first round of interviews the structural change was discovered and the flexibility of the method allowed for creation of an intervention to meet the new needs, as compared to more fixed methods which would have required that the project be completely redone or implemented despite a lack of benefit. This ability to change in a timely fashion potentially prevented use of resources unnecessarily. Timeliness and efficiency are important elements of healthcare quality (IHI, 2020). Our process demonstrated that the design thinking method may be an adaptable implementation framework with important timeliness and efficiency of the created intervention.

At the onset, the IRB at the organizational site had many requests for changes to recruitment, data securement and collaboration, methods for collecting and storing data, and potential exposure of a vulnerable population (RN staff). For example, recorded interviews were not allowed off the property to be shared with the project team, which limited the design thinking process. Changes were made to the proposed plan and IRB approval was ultimately received. However, the fluidity and iterative nature of the design
thinking method was somewhat limited with these changes. Design thinking had not been used as a method for quality improvement in this healthcare setting. A take-away for researchers wishing to use design thinking as an implementation framework is to consider carefully how the method aligns with IRB preferences and to consider implications for the work. An unintended consequence was that the design thinking team grew in their knowledge of the overlap between design thinking and other research methods, ultimately improving rigor of future work.

In addition to the described barriers, there were several limitations to this project applicability to the local setting and beyond. Survey response rate was a concern with a low survey response rate of 13.5%, as were initial interview rates. However, at the end of the, 11 interviews were completed. Face-to-face and scheduled meetings with the staff may have been a better way to recruit more participants than the fliers, electronic survey, and email communication. Similarly, when the survey was sent out, the overall NICU patient census was low, which resulted in RNs working on other units within the hospital at that time. This may have potentially decreased participation. Given the structural change within the system and the creation of the HUGS nursery, there was very few NICU patients with NAS. This change may have also contributed to the limited RN participation. Several RNs stated they haven’t cared for an infant with NAS and therefore could not speak from experience for knowledge, attitude, or practice. Ultimately, this information was incorporated into the suggested prototypes (an unintended benefit). Yet, the scope of the work and potential impact was still seriously limited (an unintended negative).
The final phase of this project required feedback for further development from management to gain permission to create the final prototype intervention for the RNs caring for infants with NAS. As a result of COVID 19, students in clinical practicum were removed from the organizational site to mitigate exposure to the public, staff, and patient populations. Leadership was focused on daily plans to continue the care of current patients while planning for unit/census expansion and infection control processes and were unable to review the prototypes and provide feedback. Had the project continued as planned, the student would be able to remain on the organization’s campus and the three nursing unit directors would have been interviewed. During that interview, the problem statements and prototype options would have been shared and feedback solicited on process, time frame, details within each plan, and feasibility of the prototypes. After this round of feedback, the student would have completed a final prototype. This process would have concluded this phase of the research. The next phase of work will continue outside of and after the doctoral project. In that phase of the research project the final prototype will be tested as an intervention. Thus, although the final objective of creating an educational intervention was achieved; yet, a more comprehensive outcome could have benefited the overall project. This barrier could be remedied by completing the final round of interviews as part of the intervention implementation during the next phase of scholarly work. Despite limitations in meeting aim 3, there are important lessons related to the needs of the local RNs, the learning outcomes can be used to further improve the local setting. The needs may also be studied in other groups of RNs who provide care to infants experiencing NAS.
Conclusion

Neonatal Abstinence Syndrome (NAS) is a consistent problem in Southwestern VA and in the local setting. The results from this study are congruent with other literature findings suggesting that nurses are challenged to care for NAS babies. For some nurses, their attitude towards the mothers specifically could be a barrier to high quality care. Nurses overall demonstrated an attitude of care towards infants with NAS and felt that the benefits of caring for these infants outweighed the challenges.

The design thinking framework was difficult to implement within the constraints of the IRB. However, it showed flexibility which prevented inefficiencies in the work and allowed for timely adaptation to changes in the context. The framework complements well the IHI Psychology of Changes model for use in quality improvement work. Future research could go beyond implementing the ideal of co-creation and test the theory.

Additional research on the topic of caring for infants with NAS is needed. Other settings should be evaluated for the problem statements that were identified in this project. The two study prototypes should be researched using methods that allow for evaluation and implementation in other settings for generalization of results.
Appendix A

Case Study

Case study: “An infant is born to a woman who is 22 years of age and G1 P1. The infant is born at 39 weeks with an uncomplicated spontaneous vaginal delivery. The mother has a history of polysubstance abuse and was on methadone maintenance throughout her pregnancy. The infant is transferred to the neonatal intensive care unit for signs of neonatal abstinence syndrome. Q1: Which of the following symptoms would you expect to see in an infant going through withdrawal from methadone? Please circle your answers (multiple answers). Q2: At or above what score on the Modified Finnegan Scale would treatment be initiated? Please circle your answers. Q3: After the infant is scored, it is deemed necessary to initiate treatment. What treatment modalities would you implement? (multiple answers).”
Appendix C

NAS Survey Tool

<table>
<thead>
<tr>
<th>Participants' Attitudes regarding care of infants with NAS</th>
<th>strongly disagree</th>
<th>disagree</th>
<th>neither</th>
<th>agree</th>
<th>strongly agree</th>
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</thead>
<tbody>
<tr>
<td>Likert Scale Questions (Options are: Strongly disagree, disagree, neither, agree, strongly agree)</td>
<td></td>
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<tr>
<td>I believe that infants with NAS should be cared for in a critical care environment such as the NICU.</td>
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<td>I frequently blame the mother of an infant with NAS for the infant's health problems.</td>
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<td>I find dealing with mothers of infants with NAS to be stressful or upsetting.</td>
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<td>When interacting with a mother of an infant with NAS, I consider the potential circumstances surrounding her drug use.</td>
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<td>I feel that the rewards of caring for an infant with NAS outweigh the challenges of caring for an infant with NAS.</td>
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<td>I find it frustrating when the mother of an infant with NAS is infrequently present to provide care for her infant.</td>
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<td>I believe that I am responsible for caring for the mother of an infant with NAS as well as the infant.</td>
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</table>

<table>
<thead>
<tr>
<th>Participants' Knowledge regarding care of infants with NAS</th>
<th>strongly disagree</th>
<th>disagree</th>
<th>neither</th>
<th>agree</th>
<th>strongly agree</th>
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<tbody>
<tr>
<td>I feel that I have enough knowledge about NAS to provide adequate care for affected infants.</td>
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<td>I know how to appropriately document the care I provide to an infant with NAS.</td>
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<td>I have received adequate training on the use of assessment tools used with infants with NAS.</td>
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<td>I have adequate knowledge about various maintenance/pain medications and their effects on the newborn infant.</td>
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<td>I feel that I am knowledgeable enough about commonly used drugs in treating NAS to safely administer them.</td>
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<td>I feel that I have enough knowledge about addiction to appropriately deal with mothers of infants with NAS.</td>
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<td>I am knowledgeable about in-home or outpatient treatment of infants with NAS</td>
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</table>

<table>
<thead>
<tr>
<th>Participants' Perceptions regarding clinical practice in NAS care</th>
<th>strongly disagree</th>
<th>disagree</th>
<th>neither</th>
<th>agree</th>
<th>strongly agree</th>
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<tr>
<td>I frequently use nonpharmacological interventions when caring for a baby.</td>
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<td>I score infants with NAS frequently using the Finnegan Scale or another tool.</td>
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<tr>
<td>The score I assign to an infant with NAS is accurate and objective.</td>
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<td>I advocate for mothers of infants with NAS to breastfeed their infants.</td>
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<td>I believe that my unit has developed adequate practice protocols in caring for infants with NAS and their families.</td>
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<td>I feel that my unit has created an appropriate environment/facility to care for infants with NAS and their families.</td>
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### Summary Report of the Case Study

**Q1. Signs and symptoms of withdrawal**
- Jitteriness
- Increased sleeping
- Increased alertness
- Feeding difficulties
- High-pitched cry
- Mottling
- Sneezing
- Excoriation of skin

**Q2. Score to start treatment**
- Score of 8

**Q3. Interventions**
- Swaddling
- Morphine therapy
- Vertical rocking
- Phenobarbital
- Decreased stimulation
- Intravenous fluids

**Case Study:** An infant is born to a woman who is 22 years of age and G1P1. The infant is born at 39 weeks with an uncomplicated spontaneous vaginal delivery. The mother has a history of polysubstance abuse and was on methadone maintenance throughout her pregnancy. The infant is transferred to the neonatal intensive care unit for signs of neonatal abstinence syndrome. **Q1:** Which of the following symptoms would you expect to see in an infant going through withdrawal from methadone? Please circle your answers (multiple answers). **Q2:** At or above what score on the Modified Finnegan Scale would treatment be initiated? Please circle your answers. **Q3:** After the infant is scored, it is deemed necessary to initiate treatment. What treatment modalities would you implement? (multiple answers).
References


