

Eat Sleep Console for the Management of Neonatal Abstinence Syndrome:

A Process and Outcomes Evaluation

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Abstract

Introduction: The purpose of the project was to conduct an evaluation of a practice change to Eat Sleep Console (ESC) on the postpartum unit and neonatal intensive care unit (NICU) of a Baby-Friendly® tertiary hospital.

Method: Guided by Donabedian's quality care model, a process and outcomes evaluation of ESC was conducted through a retrospective chart review and the *Eat Sleep Console Nurse Questionnaire*, which assessed processes of care and knowledge, attitudes and perceptions of nurses.

Results: Improvement in neonatal outcomes including a decreased need for NICU admission (44% vs 20%; $p = .022$) and number of morphine doses (12.33 vs 3.17; $p = .045$) was noted pre- to post-intervention. Breastfeeding at discharge increased from 38% to 57%, but did not reach statistical significance. Thirty-seven nurses (71%) completed the full survey.

Discussion: Use of ESC resulted in positive neonatal outcomes. Nurse-identified areas for improvement resulted in a plan for continued improvement.

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The prevalence of opioid use disorder (OUD) among women delivering in US hospitals increased from 1.5 to 6.5 per 1,000 births during the period from 1999 to 2014 (Haight, Ko, Tong, Bohm, & Calaghan, 2018). Prenatal opioid exposure puts neonates at risk for withdrawal symptoms, known as neonatal abstinence syndrome (NAS). In-utero exposure to opioids can cause significant neonatal morbidity and can be life threatening. This prenatal exposure can result from prescribed opioid pain relievers, treatment for OUD with methadone or buprenorphine, as well as illicit opioid use (Patrick, Barfield, Poindexter, & AAP Committee on Fetus and Newborn, Committee on Substance Use and Prevention, 2020).

Opioid-exposed neonates with NAS experience a variety of clinical symptoms, including those of the central nervous system, gastrointestinal system, musculoskeletal system, and increased activation of the autonomic nervous system (Patrick et al., 2020). Onset of symptoms typically begin by 24-72 hours of life; the length of time neonates experience symptoms of withdrawal varies, but can be seven days or longer (Patrick et al., 2020). Lengthy hospital stays often require admission to the neonatal intensive care unit (NICU) for monitoring and treating neonates with replacement opioids which involve a long taper over several days (Spence et al., 2020). This leads to separation of the mother-infant dyad, a focus on pharmacologic management of NAS, and increased healthcare costs (Grossman et al., 2017). These costs for NAS care totaled \$462 million among Medicaid-funded births in 2014, an increase from \$65.4 million dollars in 2004 (Winkelman, Villapiano, Kozhimannil, Davis, & Patrick, 2018).

Traditionally, the most common tool used for assessment of NAS symptoms is the Finnegan Neonatal Abstinence Scoring System (FNASS). Nursing staff use this assessment tool

to rate infants on clinical symptoms of NAS, and assign a numerical score. The scores are used to determine if NICU admission and initiation of pharmacologic treatment are required (Grossman et al., 2017). Challenges to using the FNASS include the subjectivity of ratings, poor perceived interrater reliability, lack of validation, and the need to disturb neonates to assess their symptoms (Blount, Painter, Freeman, Grossman, & Sutton, 2019).

Eat Sleep Console

Varied approaches to care for opioid-exposed neonates has led to recent changes to standardize care with an emphasis on the well-being of the mother-infant dyad and on maximizing nonpharmacologic interventions. In 2017, researchers from Yale New Haven Children's Hospital demonstrated improved neonatal outcomes with an approach to NAS that focused on a simplified assessment of the functional well-being of neonates and an emphasis on nonpharmacologic interventions (Grossman et al., 2017). This approach to NAS management is known as the Eat Sleep Console (ESC) model of care. ESC relies on the functional assessment of the infant, specifically, if the infant can eat an appropriate amount; sleep undisturbed at least one hour between assessments; and if crying, be consoled within 10 minutes by soothing methods, such as holding, rocking, and swaddling (Grossman et al., 2017). If maximizing nonpharmacologic interventions is unsuccessful, the care team decides if a higher level of care and initiation of an as-needed dose of morphine are required, instead of the traditional medication-weaning process.

The ESC approach improves neonatal outcomes and fosters a collaborative relationship with parents, who have a proactive role in the care of their infant (Grossman et al., 2017). By using ESC, Grossman et al. (2017) reduced length of stay (LOS), and decreased the proportion of infants treated with morphine and costs of hospitalization for those with NAS. Various reported

quality initiatives support the use of ESC to improve neonatal outcomes (Achilles & Castaneda-Lovato, 2019; Blount et al., 2019; Grossman et al., 2017; Hein et al., 2021; Miller & Willier, 2021; Parlaman, Deodhar, Sanders, Jerome, & McDaniel, 2019; Spence et al., 2020; Wachman et al., 2018, 2020).

Change in Practice for NAS Management

An interdisciplinary healthcare team of a hospital in the northeast implemented the ESC model of care for the management of NAS through quality improvement (QI) processes on the mother-baby postpartum unit and NICU at the end of January 2021. The aim of the QI initiative was to improve neonatal outcomes, including to decrease hospital LOS with the ESC model of care. The previous method of NAS assessment was the FNASS, in which scores were used determine if NICU admission was needed, and when pharmacologic treatment with morphine, using a weaning process, was initiated.

To understand the effectiveness of the change in practice to ESC for NAS management on the mother-baby postpartum unit and NICU compared to the previous method a process and outcomes evaluation was needed to identify the extent newborn outcomes improved, the extent the QI process worked as planned, the gaps in ESC practices, and the significance of this practice change to nurses.

Structures and Processes of ESC Implementation (Table 1)

ESC Policy and Staff Training

The interdisciplinary team created an ESC clinical care guideline within the *Neonatal Abstinence Syndrome Treatment Policy*; updated the *Infant Feeding Policy*; created and distributed learning modules via HealthStream™ to nurses, patient care technicians, and pediatric providers; and created electronic health record updates for documentation of ESC assessments.

All clinical staff working on the mother-baby postpartum unit and NICU were required to complete the training and orientation to the clinical care guideline. Completion time for the training modules was approximately one hour.

Nonpharmacologic Care

Rooming-in, or keeping the mother-infant dyad together in the same hospital room, instead of keeping the infant in the nursery, promotes family-centered care practices; feeding infants on demand; mother-infant bonding; and the ability of parents to console with nonpharmacologic interventions (Grossman et al., 2017). Prior to the implementation of ESC, rooming-in was standard practice for mother-baby care on the postpartum unit, including opioid-exposed neonates. Skin-to-skin care, the practice of placing the neonate naked except for the diaper upright on the bare chest of the mother, was a previously established practice as a component of the Baby-Friendly Hospital Initiative and as standard breastfeeding care on the postpartum unit. With ESC implementation, skin-to-skin, breastfeeding, swaddling, holding, gentle handling, using a pacifier for nonnutritive suckling, and maintaining a quiet room environment with low stimulation were standardized as structures of nonpharmacologic care for infants with NAS.

Support of Breastfeeding

If not contraindicated for active illicit drug use or HIV positive status, mothers were encouraged to breastfeed and/or feed expressed breastmilk. Lactation services were included as part of standard postpartum mother-baby care practices, including for opioid-exposed mother-infant dyads. The *Infant Feeding Policy* contained previously established guidelines for breastfeeding women with OUD based on the Academy of Breastfeeding Medicine guidelines (Reece-Stremtan & Marinelli, 2015). This policy was reviewed during ESC implementation.

Simplified Functional-based ESC Assessments/ Use of a Care Tool

Functional assessments of the neonate's ability to eat, sleep, and be consoled are completed by the primary nurse, with input from the neonate's mother. An educational booklet with newborn care journal was created for use by nurses to educate families and encourage parents to document infant feeds, voids and stools, and the nonpharmacologic methods used to console their infant. Nurses assess neonates every 3-4 hours, not by waking them for scoring as with the FNASS, but by consulting parents and answering yes or no questions.

- Does the infant have poor eating due to NAS?
- Is the infant unable to sleep 60 consecutive minutes due to NAS since prior scoring?
- Is the infant unable to be consoled within 10 minutes? (Grossman et al., 2017).

If all are “no” responses, the baby is considered to be tolerating withdrawal. If any “yes” responses are given, a second nurse makes an assessment. If there is consensus on the assessment, a huddle of the bedside nurse, a pediatric provider, and a parent is called to further assess the infant, and plan for further interventions. When the neonate with NAS has difficulty meeting the functional criteria, nurses and providers encourage families to optimize nonpharmacologic interventions. If this is unsuccessful, admission to the NICU for monitoring and initiation of pharmacologic treatment is recommended.

Medication as Needed

Newborns were admitted to the NICU if pharmacologic treatment was needed for NAS symptoms. The hospital implementation team used a weight-based morphine dose of 0.04 mg/kg/dose once by mouth as-needed for symptoms not resolved with nonpharmacologic care.

Empowering Parents

Parental presence and engagement, as well as nonpharmacologic treatment measures, are core care modalities for neonates with NAS (Grossman et al., 2017). Hospital staff in both the postpartum unit and NICU were trained to focus on encouraging parents to optimize nonpharmacologic interventions.

Parental Education

Pregnant women with OUD identified in the prenatal period were scheduled for a pediatric prenatal consultation to provide education regarding the importance of maternal presence, breastfeeding, and the aspects of nonpharmacologic care.

Nurses' Role

Functional assessments and management of NAS using the ESC model of care were notable changes in practice for the hospital healthcare team. Empowering and coaching mothers to maximize nonpharmacologic interventions to treat NAS symptoms relies on nurses' time, support, and engagement with families (Stelwagen, van Kempen, Westmaas, Vet, & Scheele, 2021). This coaching role is time-intensive. Inadequate coaching of mothers due to many demands placed on nurses caring for opioid-exposed mother-infant dyads may be exacerbated by stressors including short staffing and challenges of the current COVID-19 pandemic.

Purpose

The purpose of the project was to conduct a process and outcomes evaluation of the practice change to ESC for the management of NAS compared to the previous method on the mother-baby postpartum unit and NICU of a Baby-Friendly® hospital. Results of the evaluation were used to inform stakeholders regarding the outcomes of this practice change and to construct a plan for continued improvement.

Significance of the Evaluation Project

As a pediatric nurse practitioner and member of the interdisciplinary team that planned and implemented ESC, the project lead (PL) identified the opportunity to evaluate ESC for the management of NAS. The methods employed in the evaluation project provide a template for others evaluating ESC for the management of NAS. Results of the evaluation provide information for further QI in the care of opioid-exposed mother-infant dyads.

Methods

Setting

The setting for the process and outcomes evaluation of ESC to manage NAS was a Baby-Friendly® designated, tertiary hospital in the northeast with a newly-built 20-bed postpartum unit and a 14-bed Level II NICU, both with private rooms to accommodate rooming-in. Family-centered care practices with rooming-in on the postpartum unit, for a minimum stay of 96 hours to monitor NAS symptoms, allow for continual maternal presence and promote the health of the mother-infant dyad. If NICU admission for worsening NAS symptoms occur, private rooms with accommodations for parents encourage parental presence for continued nonpharmacologic care of their infant. Institutional Review Board of the university and the Nursing Research Council of the medical center determined this project exempt.

Conceptual Model

The Donabedian quality of care model (Figure 1) was designed for application in healthcare to evaluate quality improvement efforts and provided a framework for evaluation of the practice change. Donabedian (1980) described the assessment of quality in healthcare and program evaluation by using three approaches of assessment, structure, process and outcomes, to determine if quality improvement initiatives have the desired impact.

Sample

Retrospective Chart Review Sample

To assess newborn outcomes, the PL conducted a retrospective chart review to compare preintervention and postintervention groups of opioid-exposed neonates. Neonates with NAS were identified through the *NAS Clinical Data Report*, available to the PL in the clinical practice setting as part of their role as a pediatric nurse practitioner. All newborns with a FNASS or ESC assessment in the electronic health record (EHR) were included in the *NAS Clinical Data Report*. Neonates with NAS were grouped into 18-month periods based on the 18 months prior to implementation of ESC (August 2019 to January 2021) and the first 18 months after implementation of ESC (February 2021 to July 2022). Exclusion criteria included < 35 weeks gestational age (GA) and neonates with significant comorbidities.

Nurse Participants

The population for distribution of the evaluation questionnaire included all permanent nurses on the mother-baby postpartum unit and NICU (n = 52). Inclusion criteria were all nursing staff employed by the hospital working on the mother-baby postpartum unit or NICU who have cared for newborns with NAS since implementation of ESC at the end of January 2021.

Instrument

The *Eat Sleep Console Nurse Questionnaire (ESCNQ)* requested informed consent and demographic information including practice site, number of years at the practice site, age in years, and highest educational degree. The questionnaire was divided into three sections including items developed by the PL and items from a previous study by Romisher, Hill, & Cong (2018). Permission was obtained from Dr. X Cong to use selected questions from a published study regarding nurses' knowledge, attitudes and practices with NAS (Romisher et al., 2018).

Face validity was established by the authors for their questionnaire (Romisher et al., 2018). Selected questions were included in part one of the *ESCNQ* assessing nurses' knowledge, attitudes and perceptions of NAS and ESC.

The PL created part two of the *ESCNQ*, which included questions regarding the fidelity to the processes of NAS care by nurses using the implemented structures of the ESC model and their perceived confidence with the processes of NAS care. Part three of the questionnaire included three open-ended questions to explore nurses' perceptions of the benefits, and challenges of the practice change to ESC, and nurses' suggestions to address identified challenges. The PL's doctoral committee and program faculty reviewed and approved the *ESCNQ* items, establishing face validity.

Process and Outcomes Evaluation of ESC for the Management of NAS

Evaluation of fidelity to the processes of care was assessed using the *ESCNQ* and the retrospective chart review. Evaluation of the outcomes of care was conducted through the retrospective chart review to compare pre-ESC (August 2019 to January 2021) and post-ESC (February 2021 to July 2022) groups of opioid-exposed newborns identified through the hospital's *NAS Clinical Data Report*. The hospital interdisciplinary team's aim for the implementation of ESC was to decrease the average LOS for newborns with NAS by 10%. Thus, the primary outcome measure for the implementation of ESC was average LOS, calculated from day of birth to day of discharge. Secondary newborn outcomes included NICU admission for NAS, LOS in NICU, total amount of morphine in milligrams, total number of morphine doses, total number of morphine treatment days, and breastfeeding or breastmilk feeding initiation, exclusivity, and any at discharge. Additional outcomes including nurses' self-reported

knowledge, attitudes, perceptions, and confidence with aspects of NAS care were assessed using the *ESCNQ*.

The *ESCNQ* was administered online via Qualtrics and distributed to nurses (n = 52) on the mother-baby postpartum unit and NICU. The questionnaire was available for a period of 30 days and nurses' responses were anonymous. A 5-point Likert scale, ranging from strongly disagree (1) to strongly agree (5), was used for responses to questions about nurses' knowledge, attitudes, and perceptions of practice in part one of the questionnaire.

For questions regarding the processes of NAS care by nurses using the implemented structures of the ESC model of care, a 5-point Likert scale ranging from never (1) to always (5) was used. For nurse' perceived confidence with the processes of care, a 5-point Likert scale ranging from none (1) to very much (5) was used.

Part three of the *ESCNQ* included three open-ended questions regarding nurses' perceptions of the benefits and challenges of ESC and their suggestions to address the identified challenges. Answering these questions allowed nurses the opportunity to contribute to solutions to identified barriers to manage NAS using ESC.

Data Analysis

Demographic and NAS clinical data were compared between pre- and post-ESC groups. Descriptive statistics including mean, median, and proportions were performed. Categorical variables were compared with chi-square test, or Fisher's exact test (if cell sample size < 5). Continuous variables were compared using independent samples t-test or Mann-Whitney U test based on distribution of data. A 2-tailed value of $\leq .05$ was considered statistically significant. Statistical analysis was performed using IBM SPSS Statistics for Windows, Version 28.0.

Multiple-choice responses from the questionnaire were analyzed through Qualtrics using frequencies and proportions. Anecdotal data from the three open-ended questions were categorized.

Results

Retrospective Chart Review

A total of 80 charts met inclusion criteria for analysis, including 45 neonates with NAS in the 18 months prior to ESC implementation (August 2019 to January 2021) and 35 neonates from the first 18 months of ESC implementation (February 2021 to July 2022). Those excluded from analysis were eight neonates who had a NAS score (either FNASS or ESC) initiated by nursing staff, but were not diagnosed as having opioid-exposure or NAS, three infants < 35 weeks GA, and one infant from the postintervention group for significant comorbid conditions.

No statistical difference was found among demographic characteristics of pre-ESC and post-ESC groups of opioid-exposed mother-infant dyads (see Table 2). Maternal characteristics of pre- and post-ESC groups included a majority of white (91% vs 71%), non-Hispanic (96% vs 86%), publicly-insured (78% vs 91%), with current tobacco use (51% vs 57%), and on medication-assisted treatment (MAT) with buprenorphine (71% vs 63%).

Process Measures

Results from the process evaluation included fidelity to documentation of ESC assessments 100% (n = 35) and ESC parent education 100% (n = 35). Prenatal pediatric consultations took place 43% of the time (see Table 3).

Outcome measures

Results from the retrospective chart review outcomes evaluation are presented in Table 4. Among opioid-exposed neonates, most did not require admission to the NICU or require

pharmacologic treatment for NAS. For all neonates in the pre- and post-ESC groups, average length of stay, our primary outcome measure, decreased from a mean of 6.6 days to a mean of 6.0 days, but did not reach statistical significance. Secondary outcomes included statistically significant decreases in need for NICU admission for NAS from 44% to 20% ($p = .022$), number of morphine doses from ($M = 12.33$ vs 3.17 ; $p = .045$), total amount of morphine ($M = 2.87$ mg vs 0.287 mg; $p = .04$), and number of morphine treatment days ($M = 2.42$ vs 0.54 ; $p = .016$). Length of stay in the NICU decreased from 4.09 to 2.91 days but was not statistically significant. Test for normalcy were done using skewness and kurtosis. Any variable approximately normal was tested with both parametric (independent samples t-test) and nonparametric (Man-Whitney U) statistics.

The need for pharmacologic intervention for NAS decreased from 29% ($n = 13$) in the pre-ESC group to 11% ($n = 4$) in the post-ESC group. Comparing pre- and post-ESC groups receiving pharmacologic intervention, there were clinically significant decreases in number of morphine doses ($M = 42.69$ vs 27.75 ; $p = .428$), total amount of morphine ($M = 7.88$ mg to 2.52 mg; $p = .13$), and number of morphine treatment days ($M = 11.4$ vs 8 days; $p = .263$), but none reached statistical significance. Small sample size likely contributed to the results of the smaller group comparisons. Of note, two infants in the pre-ESC group received ESC for NAS prior to the formal implementation and received two as-needed doses of morphine instead of the traditional weaning process.

Although not statistically significant, proportions of breastfeeding or breast milk feeding initiation increased from 53% in the pre-ESC group to 71% in the post-ESC group, exclusivity increased from 13% to 20%, and breastfeeding or breast milk feeding at discharge increased from 38% to 57%.

Eat Sleep Console Nurse Questionnaire Results

The survey response rate was 77% (40/52), however 71% (37/52) completed the full survey. Some sections had a 75% (39/52) and 73% (38/52) completion rate. Demographic characteristics of nurse participants are presented in Table 5. The majority of nurses, 57.5% (n =23), were from the postpartum unit, while 42.5% (n = 17) were from the NICU. Most nurses had a bachelor's degree (62.5%). Nurses reported a mean number of years at their practice site as 7.33, and a mean age of 37.4 years.

Process Measures

Results of the fidelity to the processes of NAS care assessed via the *ESCNQ* are summarized in Table 6. Nurses reported often or always providing parent education about NAS (71%), and parent education about nonpharmacologic care of the infant (81%). A gap in care practices was noted in that 50% of nurses reported often or always providing education with the parent booklet, and less than half of nurses (35%) often or always encouraging use of the newborn care journal.

When providing care for infants with NAS, the majority of nurses reported often or always providing nonpharmacologic interventions of swaddling (100%), quiet environment (98%), low-level lighting (100%), and pacifier for non-nutritive sucking (95%). The majority of participants reported often or always encouraging mothers to use rooming-in (87%), skin-to-skin care (74%), breastfeeding (if not contraindicated) (90%), holding and gentle rocking (100%), and gentle handling (97%). This suggests high fidelity to nonpharmacologic care processes of ESC.

Outcome measures

Knowledge. Of nurses surveyed, most agreed or strongly agreed to having enough knowledge about NAS (90%), and knowing how to appropriately document NAS care (89%).

However, fewer participants agreed or strongly agreed they have adequate training on the ESC assessment tool (54%) and enough knowledge about addiction to deal with mothers of infants with NAS (54%), identifying an area for further improvement. See Table 7 for full range of responses.

Attitudes. Most nurses surveyed disagreed or strongly disagreed with blaming the mother for the infant's health problems related to NAS (71%). However, nurses expressed feeling stress surrounding aspects of NAS care. Only 58% of nurses disagreed or strongly disagreed dealing with mothers of infants with NAS was stressful or upsetting. Participants agreed or strongly agreed they consider the circumstances surrounding maternal drug use (79%) and feel the rewards of caring for infants with NAS outweigh the challenges (74%). Yet, 43% of nurses agreed or strongly agreed they find it frustrating when the mother is infrequently present to provide care for her infant, identifying areas for continued improvement with NAS care (see Table 8).

Perceptions. Regarding nurses' perceptions of NAS care practices, less than half of participants agreed or strongly agreed their unit has developed adequate protocols for NAS (44%), while a little more than half of participants agreed or strongly agreed their unit has created an appropriate environment for NAS care (55%) (see Table 9).

Confidence. Just over half of participants reported a lot or very much confidence in providing empowering messages to mothers (caregivers) of neonates with NAS (52%), providing education to mothers on the importance of nonpharmacologic care (76%), and communicating concerns to a pediatric provider regarding an infant with NAS (78%) (See Table 10).

ESCNQ Open-ended Questions

Nurse responses to open-ended questions were categorized (see Table 11). Nurses comments regarding the positive aspects of ESC included increased bonding, increased family involvement, and decreased pharmacologic intervention. Identified challenges included the burden of care with lack of parental presence, and nurses not being heard regarding concerns for infant well-being. Suggestions to improve NAS care included use of volunteers or “cuddlers” when parents are not present for care, changes to improve documentation, and the need for education on how to care for families of infants with NAS.

Discussion

A process and outcomes evaluation of ESC provided insight regarding the effectiveness of the practice change on the identified newborn outcomes. As with other initiatives reporting the implementation of ESC, pre- and post-ESC groups of opioid-exposed neonates were compared for outcomes including LOS, pharmacologic treatment and breastfeeding rates. Comparing the pre- and post-ESC groups, there was no statistically significant decrease in LOS. However, we found a statistically significant difference in morphine received, and morphine treatment days in the post-ESC group. Most infants in both our pre- and post-ESC groups did not require NICU admission for NAS or pharmacologic intervention for NAS management. This is likely due to differences noted in our pre-ESC NAS care practices compared to those of previous initiatives reporting ESC implementation. Both of our pre-and post-ESC groups were exposed to rooming-in as part of routine care practices within the Baby-Friendly Hospital Initiative. Rooming-in promotes family-centered care practices, feeding infants on demand, mother-infant bonding, and the ability of parents to console with nonpharmacologic interventions (Grossman et al., 2017). Since October 2020, our new NICU accommodates rooming-in for parents of infants with NAS, so even parents of infants admitted to the NICU have the opportunity to room-in. Parlamen et al.

(2019) found their baseline LOS and amount of morphine needed for NAS lower than other studies, attributing it to the ability to provide rooming-in at the two hospital sites in their study.

Conversely, Grossman and colleagues (2017) reported that prior to ESC implementation all infants at risk for NAS were admitted to the NICU, which did not accommodate rooming-in. With their implementation of ESC, if NAS scores were high, infants were transferred to the inpatient pediatric unit so mothers could room-in, and they saw statistically significant improvement in newborn outcomes for NAS including decreased LOS and need for pharmacologic treatment for NAS (Grossman et al., 2017).

Similarly, Miller & Willier (2021) conducted a retrospective chart review comparing groups of infants with NAS. This team moved patients with NAS out of NICU to inpatient pediatric unit with private rooms to promote rooming-in and found rooming-in decreased LOS for infants with NAS (Miller & Willier, 2021). These two studies demonstrate variation in preintervention care practices compared to our preintervention practices.

In our post-ESC group, breastfeeding or breastmilk feeding rates increased (refer to Table 5). Although not statistically significant, this has clinical significance. Breastfeeding is considered a critical component of mother-infant care for opiate-exposed neonates, but rates of breastfeeding initiation, exclusivity, and duration are low among women with OUD (Patrick et al., 2020). In their review, Wu and Carre (2018) found breastfeeding decreases length of stay, severity and duration of NAS symptoms, decreases hospital costs, and helps to strengthen the mother-infant dyad. Through our Baby-Friendly® designation (since 2000), we prioritized breastfeeding support for mother-infant dyads. In fact, in the *ESCNQ*, most nurses responded they often or always (90%) encourage mothers to breastfeed (if not contraindicated) as part of nonpharmacologic interventions of NAS care. Our breastfeeding policy, although updated during

our implementation of ESC, included guidelines to support mothers with opioid-use disorder on MAT for both our pre- and post-ESC groups if mothers were not actively using illicit substances or HIV positive.

Results from the process evaluation revealed strong fidelity to parent education. Prenatal education regarding the aspects of ESC, including breastfeeding, was identified as a core component of the ESC model of care (Blount et al., 2019; Hein et al., 2021; Miller & Willier, 2021; Parlaman et al., 2019; Spence et al., 2020; Wachman et al., 2018). Learning what to expect during the hospitalization, prior to the presentation of NAS symptoms, prepares parents for their role in care of their infants (Grossman et al., 2017). Although 100% of neonates' charts revealed documentation of parent education, only 50% nurses often or always used the parent handbook to educate parents. Further exploration of methods of parent education is needed.

This evaluation provided insight into the perceptions of nurses with the change in practice to ESC for the management of NAS. Most importantly, nurses' feedback identified further support and educational needs with NAS care, addiction, and communicating with mothers with OUD. About half of nurses agreed/strongly agreed they have adequate training in use of the ESC tool and enough knowledge about addiction, while only half of nurses had a lot/very much confidence providing empowering messaging to mothers of infants with NAS. Educational and organizational support of nurses in their care of infants with NAS is vital. Nurse-identified gaps in education regarding care of infants with NAS must be a component of our future QI efforts.

Often nurses' work goes unrecognized by others on a healthcare team, and is difficult to quantify (Ash & Miller, 2021). Collecting stakeholder data from nurses' first-hand experiences and perspectives with ESC processes provided important information regarding this change in

practice, identified barriers to NAS care, and allowed for a plan of course-correction to increase the stability and sustainability of ESC. Anecdotal data reported by nurses revealed a burden of care for infants with NAS when parents are not present to console, and concerns of not-being-heard when bringing concerns to a pediatric provider. More work needs to be done to support nurses in their care of infants with NAS. Investing in training and education for nurses promotes positive interactions and communication with mothers of infants with NAS. New processes including staff education regarding addiction, OUD in pregnancy, and trauma-informed care promotes continued improvement, addresses gaps, and empowers nurses to care for this vulnerable population.

Limitations of this evaluation project include a lack of generalizability due to the small retrospective chart review sample of neonates, a small sample size of neonates requiring pharmacologic management for NAS and a small homogeneous sample of nurses from one hospital in the northeast. The PL developed the *ESCNQ* using questions from a previous study with established face-validity, and self-developed questions regarding the processes of care consistent with the ESC model of care for NAS management. Further testing of validity and reliability are needed.

Conclusion

Data obtained from the evaluation contributes to the current evidence supporting ESC to decrease NICU admissions and pharmacologic interventions for neonates with NAS. This evaluation supports the use of nonpharmacologic care practices for the management of NAS and holistic, family-centered approaches to care for opioid-exposed mother-infant dyads in order to optimize health outcomes for infants with NAS.

Nurse-identified areas for improvement and gaps in practices necessitate a plan of action for continued QI. Recognizing challenges faced by nurses caring for opioid-exposed mother-infant dyads and implementing strategies to support nurses who encourage mothers in the care of their infants with NAS promote quality care. Supporting women with OUD in the perinatal period is needed to optimize health outcomes for infants and their mothers.

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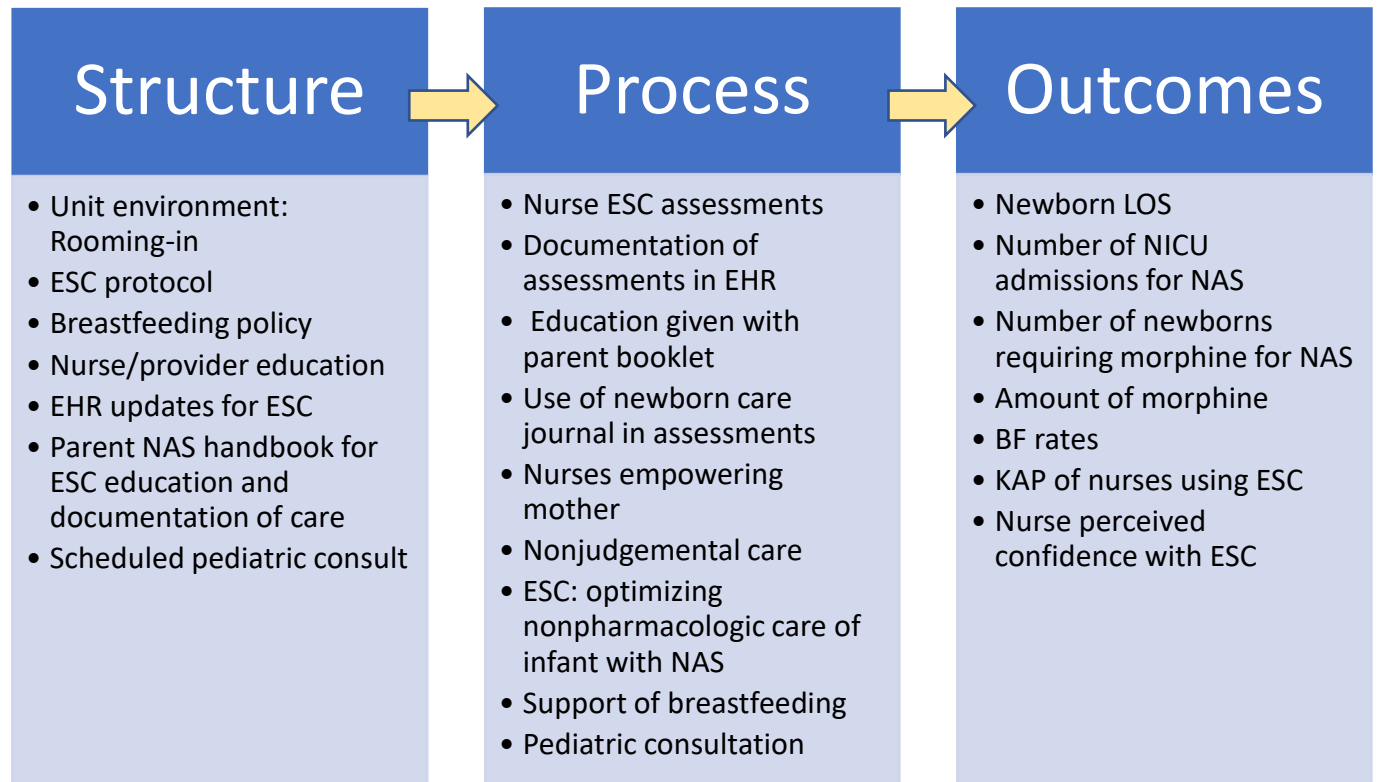
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Table 1*Structures and Processes of ESC Implementation*

Previous Structures	-Baby Friendly® designated hospital -Private hospital rooms on postpartum unit; 96 hour admission for NAS -Private NICU rooms with accommodations for parents to stay (2020-present) -Rooming-in: all neonates room-in with their mothers, including opioid-exposed neonates -Skin-to-skin care routine postpartum care/ kangaroo care in the NICU -Breastfeeding support; lactation services -Using a pacifier for nonnutritive suckling for neonates with NAS -<i>Infant Feeding Policy</i> with guidelines for opioid-exposed neonates (revised with ESC)
New Structures	-EHR updates for documentation of ESC assessments -Standardized swaddling, holding, gentle handling, maintaining a quiet room environment with low stimulation -Educational booklet with newborn care journal, <i>Neonatal Abstinence Syndrome Guide for Families</i> -HealthStream™ training modules, <i>Eat Sleep Console: Changing the way We Treat NAS parts 1 & 2</i>, to nurses, patient care technicians, and pediatric providers -ESC clinical care guideline within the <i>Neonatal Abstinence Syndrome Treatment Policy</i> -Pediatric consultation in prenatal period
Processes of ESC	-Pregnant women with OUD identified in the prenatal period receive pediatric consultation for ESC education -Breastfeeding support (if not HIV+ or illicit use of drugs) -Education of parents using <i>Neonatal Abstinence Syndrome Guide for Families</i> -Parents use NAS care journal to document nonpharmacologic measures used -Hospital staff focus on coaching parents to optimize nonpharmacologic interventions -Nurses complete and document ESC functional assessments every 3-4 hours -Second nurse verifies high score and huddle is called, NICU admission as-needed -Weight-based morphine dose of 0.04 mg/kg/dose once by mouth as-needed

Note: Eat Sleep Console (ESC); neonatal abstinence syndrome (NAS); neonatal intensive care unit (NICU); electronic health record (EHR); opioid use disorder (OUD)

Figure 1*Structure Process Outcomes Model for the Evaluation of ESC*

Note. Eat Sleep Console (ESC); electronic health record (EHR); neonatal abstinence syndrome (NAS); length of stay (LOS); neonatal intensive care unit (NICU); breastfeeding (BF); knowledge attitudes, perceptions (KAP)

Table 2*Demographic Characteristics of Opioid-exposed Mother-infant Dyads*

Newborn Characteristics	Pre-ESC Group ^a n (%) or mean $\pm$ SD	Post- ESC Group ^b n (%) or mean $\pm$ SD	<i>p</i>
Female	24 (53%)	18 (51%)	.866 ^x
Male	21 (47%)	17 (49%)	.866 ^x
Gestational age	38.9 $\pm$ 1.69	38.7 $\pm$ 1.40	.676 ^x
Birth weight in grams	3070.98 $\pm$ 544.3	3053.14 $\pm$ 496.9	.880 ^t
Discharge weight in grams	2907.11 $\pm$ 554.7	2865.89 $\pm$ 497.2	.731 ^t
5-minute APGAR	8.78 $\pm$ 0.471	8.71 $\pm$ 0.825	.870 [^]
Maternal Characteristics	Pre-ESC Group ^a n (%) or mean $\pm$ SD	Post-ESC Group ^b n (%) or mean $\pm$ SD	<i>p</i>
Age in years	30.53 $\pm$ 4.8	29.06 $\pm$ 5.5	.206 ^t
Race			
White	41 (91%)	27 (77%)	.199*
Black	2 (4.4%)	4 (11.4%)	
Other	2 (4.4%)	4 (11.4%)	
Hispanic	2 (4%)	5 (14%)	.318*
C-section	17 (38%)	11 (31%)	.555 ^x
Gravida	3.20 $\pm$ 1.86	3.27 $\pm$ 2.06	.863 ^t
Illicit substance use	15 (33%)	9 (26%)	.461 ^x
Polypharmacy ⁷	11 (24%)	4 (11%)	.116*
Current cigarette smoking	23 (51%)	20 (57%)	.101 ^t
Public insurance	35 (78%)	32 (91%)	.089*
Private insurance	10 (22%)	3 (9%)	.089*
MAT Buprenorphine	32 (71%)	22 (63%)	.591 ^x
MAT Methadone	2 (4%)	6 (17%)	.067*

Note. ^a n = 45; ^b n = 35; ^x Chi Square test; ^t Independent Samples t-test; [^] Mann-Whitney U test;

* Fisher's Exact Test; 'three or more medications (methadone, buprenorphine, selective serotonin reuptake inhibitor, gabapentin, benzodiazepines); $p \leq .05$ considered statistically significant

Table 3*Processes of ESC (Retrospective Chart Review)*

Processes measure	n (%)
ESC assessments documented	35(100%)
ESC parent education documented	35(100%)
Prenatal pediatric consultation documented	15(43%)

Table 4*Outcome Measures (Retrospective Chart Review)*

Outcome Measure	Pre-ESC Group ^a n (%) or mean $\pm$ SD (Min-Max)	Post- ESC Group ^b n (%) or mean $\pm$ SD (Min-Max)	<i>p</i>
Length of stay: total days	6.60 $\pm$ 4.3 (4-21)	6.00 $\pm$ 3.7 (4-24)	.516 [^]
NICU admission for NAS	20 (44%)	7 (20%)	.022[^]
Length of stay in NICU in days	4.09 $\pm$ 5.5 (0 – 20)	2.91 $\pm$ 4.5 (0 – 20)	.309 [^]
Number of morphine doses	12.33 $\pm$ 24.9 (0 – 102)	3.17 $\pm$ 15.0 (0 – 87)	.045[^]
Total amount morphine (mgs)	2.27 $\pm$ 5.61 Median .00 (.0 - 31.69)	0.287 $\pm$ 1.36 Median .00 (.0- 7.92)	.040[#]
Number of morphine treatment days	2.42 $\pm$ 4.6 (0 - 18)	0.54 $\pm$ 1.9 (0 -10)	.016[^]
Breastfeeding or BMF			
- Initiation	24 (53%)	25 (71%)	.099
- Exclusivity	6 (13%)	7 (20%)	.423
- At discharge	17 (38%)	20 (57%)	.085
Pharmacologic Treatment Group: Outcome Measures	13 (29%)	4 (11%)	.097 ^x
Number of morphine doses	42.69 $\pm$ 29.54 (2*- 102)	27.75, $\pm$ 40.55 (1 - 87)	.428 [^]
Total amount morphine (mgs)	7.88 $\pm$ 8.24 Median 6.38 (0.236*- 31.69)	2.52 $\pm$ 3.68 Median 1.01 (0.12 – 7.92)	.130 [#]
Number of morphine treatment days	11.3 $\pm$ 4.66 (2*- 18)	8.0, $\pm$ 6.05 (1 - 10)	.263 [^]

Note. ^a n = 45; ^b n = 35; [^]Independent samples t-test; [#] Mann-Whitney U; ^x Chi-squared test;

*received ESC in Pre-ESC group; $p \leq .05$ considered statistically significant

Table 5
Demographic Characteristics of Nurse Participants

Characteristic	n (%) or mean $\pm$ SD (min-max)
Nursing practice site	Postpartum 23 (57.5%) NICU 17 (42.5%)
Number of years at practice site	7.33 $\pm$ 9.06 (1 – 33)
Age in years	37.4 $\pm$ 12.1 (21 - 64)
Highest educational degree	Diploma/Associate 11 (27.5%) Bachelor's 25 (62.5%) Master's 4 (10%)

Table 6
Processes of ESC (ESCNQ)

Nurse-reported Processes of ESC n=38	Never n (%)	Rarely n (%)	Sometimes n (%)	Often n (%)	Always n (%)
When providing care for infants with NAS, how often do you provide parent (caregiver) education on NAS?	0 (%)	4 (11%)	7 (18%)	17 (45%)	10 (26%)
When providing care for infants with NAS, how often do you provide parent (caregiver) education on the importance of nonpharmacologic care for their infant?	0 (%)	0 (%)	7 (18%)	16 (42%)	15 (39%)
When providing care for infants with NAS, how often do you provide parent (caregiver) education using the <i>Neonatal Abstinence Syndrome Guide for Families</i> booklet?	7 (18 %)	6 (16%)	6 (16%)	9 (24%)	10 (26%)
When providing care for infants with NAS, how often do you encourage parents (caregivers) to use the newborn care journal within the <i>Neonatal Abstinence Syndrome Guide for Families</i> booklet?	7 (18%)	9 (24%)	9 (24%)	9 (24%)	4 (11%)

When providing care for infants with NAS, how often do you routinely provide the following nonpharmacologic interventions:	Never n (%)	Rarely n (%)	Sometimes n (%)	Often n (%)	Always n (%)
swaddling	0 (%)	0 (%)	0 (%)	3 (8%)	35 (92%)
quiet environment	0 (%)	0 (%)	1 (3%)	6 (16%)	31 (82%)
low-level lighting n=37	0 (%)	0 (%)	0 (%)	8 (22%)	29 (78%)
Pacifier	0 (%)	0 (%)	2 (5%)	8 (21%)	28 (74%)
When providing care for infants with NAS, how often do you routinely encourage mothers (caregivers) to use the following nonpharmacologic interventions:	Never n (%)	Rarely n (%)	Sometimes n (%)	Often n (%)	Always n (%)
rooming-in	0 (%)	1 (3%)	4 (11%)	12 (32%)	21 (55%)
skin-to-skin care	0 (%)	3 (8%)	7 (18%)	16 (42%)	12 (32%)
breastfeeding (if not contraindicated) n=37	0 (%)	0 (%)	4 (11%)	18 (49%)	15 (41%)
holding, gentle rocking	0 (%)	0 (%)	0 (%)	10 (26%)	28 (74%)
gentle handling	0 (%)	1 (3%)	0 (%)	8 (21%)	29 (76%)
When providing care for infants with NAS, how often do you routinely provide empowering messages to mothers (caregivers)?	1 (3%)	2 (5%)	12 (32%)	17 (45%)	6 (16%)

Table 7*Nurse Participants' Knowledge Regarding Care of Infants with NAS*

Nurses' Knowledge Regarding Care of Infants with NAS n = 39	Strongly Disagree n (%)	Disagree n (%)	Neither n (%)	Agree n (%)	Strongly Agree n (%)
I feel I have enough knowledge about NAS to provide adequate care for affected infants.	0 (%)	2 (5%)	2 (5%)	23 (59%)	12 (31%)
I know how to appropriately document the care I provide to infants with NAS.	0 (%)	2 (5%)	2 (5%)	20 (51%)	15 (39%)
I have received adequate training on the use of the ESC assessment tool used with infants with NAS.	0 (%)	8 (21%)	10 (26%)	12 (31%)	9 (23%)
I feel that I have enough knowledge about addiction to appropriately deal with mothers of infants with NAS.	0 (%)	9 (23%)	9 (23%)	16 (41%)	5 (13%)

Note. Questions used with permission from Dr. X. Cong from Romisher, Hill, D., & Cong, X. (2018). Neonatal Abstinence Syndrome: Exploring Nurses' Attitudes, Knowledge, and Practice. *Advances in Neonatal Care*, 18(2), E3–E11. <https://doi.org/10.1097/ANC.0000000000000462>

Table 8*Nurse Participants' Attitudes Regarding Care of Infants with NAS*

Nurses' Attitudes Regarding Care of Infants with NAS n= 38	Strongly Disagree n (%)	Disagree n (%)	Neither n (%)	Agree n (%)	Strongly Agree n (%)
I frequently blame the mother of an infant with NAS for the infant's health problems.	18 (47%)	9 (24%)	9 (24%)	1 (3%)	1 (3%)
I find dealing with mothers of infants with NAS to be stressful or upsetting.	8 (21%)	14 (37%)	10 (26%)	6 (16%)	0 (%)
When interacting with a mother of an infant with NAS, I consider the potential circumstances surrounding her drug use.	1 (3%)	1 (3%)	6 (16%)	23 (61%)	7 (18%)
I feel that the rewards of caring for an infant with NAS outweigh the challenges of caring for an infant with NAS.	1 (3%)	1 (3%)	8 (21%)	19 (50%)	9 (24%)
I find it frustrating when the mother of an infant with NAS is infrequently present to provide care for her infant.	3 (8%)	7 (18%)	12 (32%)	12 (32%)	4 (11%)

Note. Questions used with permission from Dr. X. Cong from Romisher, Hill, D., & Cong, X. (2018). Neonatal Abstinence Syndrome: Exploring Nurses' Attitudes, Knowledge, and Practice. *Advances in Neonatal Care*, 18(2), E3–E11. <https://doi.org/10.1097/ANC.0000000000000462>

Table 9*Nurse Participants' Perceptions Regarding Care of Infants with NAS*

Nurses' Perceptions Regarding Care of Infants with NAS n = 38	Strongly Disagree n (%)	Disagree n (%)	Neither n (%)	Agree n (%)	Strongly Agree n (%)
I believe that my unit has developed adequate practice protocols in caring for infants with NAS and their families.	5 (13%)	9 (24%)	7 (18%)	15 (39%)	2 (5%)
I feel my unit has created an appropriate environment to care for infants with NAS and their families.	4 (11%)	8 (21%)	5 (13%)	18 (47%)	3 (8%)

Note. Questions used with permission from Dr. X. Cong from Romisher, Hill, D., & Cong, X. (2018). Neonatal Abstinence Syndrome: Exploring Nurses' Attitudes, Knowledge, and Practice. *Advances in Neonatal Care*, 18(2), E3–E11. <https://doi.org/10.1097/ANC.0000000000000462>

Table 10*Nurse Participants' Confidence Regarding Care of Infants with NAS*

Nurses' Confidence Regarding Care of Infants with NAS n = 37	None n (%)	A little n (%)	Some n (%)	A lot n (%)	Very much n (%)
When providing care for infants with NAS, how much confidence do you have providing empowering messages to mothers (caregivers)?	0 (%)	2 (5%)	16 (43%)	14 (38%)	5 (14%)
When providing care for infants with NAS, how much confidence do you have providing education to mothers (caregivers) on the importance of nonpharmacologic care for their infant?	0 (%)	0 (%)	9 (24%)	14 (38%)	14 (38%)
When providing care for infants with NAS, how much confidence do you have communicating your concerns to a pediatric provider regarding an infant with NAS who is not eating well, sleeping well, or able to be consoled well?	0 (%)	1 (3%)	7 (19%)	12 (32%)	17 (46%)

Table 11*ESCNQ Open-ended Question Categories*

Categories of Anecdotal Data from ESCNQ		
Benefits of ESC	Challenges of ESC	Suggestions to Address Challenges
Increased mother-infant bonding	Lack of parental presence	Volunteers or “cuddlers”
Decreased pharmacologic management	Burden of care	Improvements with feeding
Increased nonpharmacologic methods	Difficult in the NICU	Need for additional interventions
Increased family involvement	Not accurate in the NICU	Lower nurse: patient ratios
Support for family	Difficulties with ESC assessment	Increase parental presence
Consoles the infant	Structural concerns	Structural improvements
Decreased NICU admission	Concerns for infant well-being	Documentation improvements
	Nurses not being heard	More education for nurses

Note. *Eat Sleep Console Nurse Questionnaire (ESCNQ)*; Eat Sleep Console (ESC); neonatal intensive care unit (NICU)