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The Impact of Utilizing the Eat, Sleep, Console Model on Pharmacologic Interventions and Length of Stay

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A masters project completed in partial fulfillment of the requirements for the degree of Masters Science—Nursing, Family Nurse Practitioner at the Valley Foundation School of Nursing, San José State University

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Abstract

Purpose: This systematic review seeks to explore whether utilizing Eat, Sleep, Console (ESC) over the Finnegan Neonatal Abstinence Scale (FNASS) in the neonatal abstinence syndrome (NAS) population decreases length of stay or pharmacological interventions.

Method: Systematic literature review utilizing CINAHL, PubMed and Google Scholar databases.

Results: Utilizing Eat Sleep Console, over FNASS decreased length of stay and pharmacologic intervention.

Conclusions: There is compelling research suggesting a change in NAS treatment from FNASS to ESC with a decrease in length of stay and pharmacologic intervention. However, there is an opportunity for further studies providing higher levels of evidence as the current studies are largely quality improvement or retrospective studies. There is also opportunity to study the effect of utilizing ESC on mother-baby dyad bonding and breastfeeding rates.

Keywords: Neonatal Abstinence Syndrome (NAS), Finnegan Neonatal Abstinence Scale (FNASS), Eat, Sleep, Console (ESC), length of stay, pharmacologic intervention

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Background

The opioid crisis in the United States has many repercussions for healthcare. One such repercussion is the increased use of opioids during pregnancy. Between 2010 and 2017 opioid related diagnoses at time of delivery increased by 131% (CDC, 2021). Infants born having been exposed to opioids in-utero can have physical symptoms of withdrawal as a result. These symptoms include gastrointestinal, neurologic, and autonomic presentations and collectively are known as neonatal abstinence syndrome (NAS) (Grisham et al., 2019; Ryan et al., 2021). Tolia et al. (2015) found that from 2004 to 2014 admission to the neonatal ICU (NICU), length of stay (LOS), and pharmacotherapy treatment for infants with NAS rose significantly (7 to 27 cases per 1000 admissions).

There is no predominant pediatric organization that recommends a way in which these patients are evaluated or treated for NAS. The most widely used NAS scoring tool is the Finnegan Neonatal Abstinence Scale (FNASS) with treatment focusing on pharmacologic intervention, typically morphine, to wean an infant from opioids (Grisham et al., 2019). The FNASS, developed in 1975, identifies 21 withdrawal symptoms, in which a healthcare staff member assigns a score based on the perceived severity of that symptom (North Carolina Pregnancy & Opioid Exposure Project, 2018). Scores of 8 or higher typically receive pharmacologic treatment (North Carolina Pregnancy & Opioid Exposure Project, 2018). FNASS has drawn criticism for its complexity and subjectivity, leading many institutions to modify the scale, making a more piecemeal approach to NAS treatment (Grisham et al., 2019). Another

criticism of FNASS is the focus on pharmacologic treatment rather than a more integrated family-centered care approach (Grisham et al., 2019).

A newer model of NAS treatment, which seeks to simplify identification while decreasing pharmacologic intervention, is the Eat, Sleep, Console (ESC) approach (Grossman et al., 2017). This model was developed by Grossman et al. (2017) and focuses on an infant's ability to function rather than on their physical symptoms of withdrawal. Healthcare workers utilizing ESC are assessing if infants are able to eat more than or equal to one ounce per feed or breastfeed well, if the infant can sleep at least an hour in between feeds, and if the infant can be consoled within 10 minutes of soothing (Grossman et al., 2017). Rather than assigning a score to symptoms the healthcare worker answers “yes” or “no” to these three questions. If there are two or three consecutive “nos” then the infant is evaluated for pharmacology therapy, however non-pharmacologic interventions are typically increased first (Hein et al., 2020). These interventions emphasize feeding the infant on demand rather than scheduled, increasing swaddling and holding, providing a low stimulation environment, and increasing family presence (Grossman et al., 2017).

This wide variety of care may be putting one of the most vulnerable patient populations at a great disadvantage and exploring optimal diagnosis and treatment in order to provide the best patient care is greatly necessary. While some literature reviews have looked at the two most prevalent Neonatal Abstinence Scoring systems (FNASS and ESC) individually, this review seeks to compare outcomes to pharmacologic use and length of stay between the two systems in order to confidently argue the use of one method over the other.

Methods

Study Purpose & Design

The purpose of this integrative review is to examine current literature regarding the efficacy of utilizing ESC compared to FNASS. Of special interest is the effects of the system on length of stay and pharmacologic intervention.

Search Strategy

An electronic systematic review was conducted with three databases CINAHL, PubMed, and Google Scholar. Search terms used included "neonatal abstinence syndrome AND/OR eat sleep console AND/OR FNASS."

Inclusion & Exclusion Criteria

Excluded from research found were literature reviews, studies prior to 2010, and publications not in the English language. Inclusion criteria involved quality improvement projects and studies both qualitative and quantitative. Inclusion criteria for these studies was also limited to Infants over 35 weeks gestation who have been identified as having Neonatal Opioid withdrawal in a Neonatal ICU or Mother baby unit that utilizes either Eat Sleep Console, Finnegan Neonatal Abstinence Scoring System, or have changed from one system to another.

Data Extraction and Analysis

For each study the following details were analyzed: hypotheses, methodology, results, and implications for further study and practice.

Quality Appraisal

Quality was appraised utilizing the Hierarchy of Evidence for Intervention Studies as published by Fineout-Overholt et al. (2010) (See Table 1).

Results

Of the three databases queried 64 articles resulted. Once excluded for duplication and title/abstract relevance 16 articles were considered. Once the full texts were studied utilizing the tool form Fineout-Overholt et al. (2010) seven results were included in this review (See Figure 1).

ESC Efficacy

Curran et al. (2020) and Ryan et al. (2021) evaluated and compared the scoring systems of FNASS and ESC for sensitivity and efficacy. Both utilized a retrospective cohort study to compare infants admitted with NAS. Ryan et al. (2021) treated one group using the FNASS algorithm and management with morphine. Then in a subsequent group they scored simultaneously using FNASS and ESC but treatment was directed by the ESC model (Ryan et al., 2021). Curran et al. (2020) retrospectively utilized the NAS population's past FNASS scores to generate proxy ESC scores for comparison. Curran et al. (2020) found that not only were the ESC proxy scores correlating to existing FNASS scores, but the proxy variables for ESC were more sensitive than those from FNASS (99.4% vs 99.3%). Therefore, the authors determined that had this second group been evaluated with the ESC tool over the FNASS the risk of not providing adequate treatment due to the scoring method was very low (Curran et al., 2020). Ryan et al. (2021) found that the ESC and FNASS scores significantly correlated with the ESC groups with the ESC groups experiencing decreased LOS (9.5 to 5 days median) and pharmacologic management (15 to 10 days median). They therefore surmised that the decreased use of the healthcare system in the ESC groups was not due to lack of screening and lack of treatment but rather the efficiency of the ESC methodology (Ryan et al., 2021).

Length of stay and Pharmacologic Intervention

Grossman et al., (2018) in their retrospective study found that pharmacologic treatment with morphine greatly decreased by using the ESC method than had these infants been evaluating using the FNASS method, though they did not go farther in evaluating the impact on length of stay. However, Blount et. al. (2019) when conducting a QI project to implement a change of practice from FNASS to ESC, did evaluate length of stay. They found morphine doses decreased from 38 to 0.3 and noted a reduction in the average LOS, 10.3 days to 4.9, in the NAS population after implementing ESC (Blount et al., 2019).

Miller & Willier (2021) performed a retrospective medical review for patients admitted with NAS 12 months prior to and 12 months following implementation of an ESC based model they termed “Baby Strength”. Like Blount et al. (2019) they found a decrease in LOS, 17.7 days to 5.9 mean days, as well as a decrease in infants that were treated with morphine, 20 to 1, as well as a breastfeeding rate increase (Miller & Willier, 2021).

Which type of pharmacologic treatment is to be utilized for NAS has also been studied. While morphine has been the favored medication, methadone and buprenorphine have also been utilized. Hein et al. (2020) and Wachman et al. (2018) implemented ESC with buprenorphine and methadone respectively. Both found a decrease in pharmacotherapy and decrease in LOS, attributing the decrease in length of pharmacologic treatment to the change from morphine to other medications (Hein et al., 2020; Wachman et al., 2018).

Discussion

Analyzing current literature shows a decrease in pharmacological treatment and length of stay by utilizing ESC over FNASS. Interestingly as highlighted by Miller & Willier (2021) there could be further benefits to ESC by increasing breastfeeding success rate. This is possibly

because of the family-centered care ESC highlights, encouraging parental participation and rooming in when possible.

Limitations and Gaps

This review was limited by the small number of high-quality literature available. Though the current research is compelling further studies in a case-control or cohort study would be warranted. Though this literature review focused on length of stay and pharmacologic intervention there is a gap in the research regarding how ESC vs FNASS may strengthen the mother-baby dyad and thus increase breastfeeding success rates.

Conclusions and Practice Implications

The population experiencing NAS has increased tremendously in recent years as the opioid crisis widens. Increasingly the number of studies are supporting a shift from the popular FNASS model to the ESC model of care as well as a change away from morphine toward alternative pharmacotherapy. ESC highlights the infant-mother dyad and encourages mothers to be as participatory, even encouraging rooming in as much as possible depending on the unit's availability (Grossman et al., 2018). With these benefits in mind, it would suggest that more facilities utilize ESC when taking care of the NAS population.

References

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Table 1.

Author/Date	**Research Question(s)/Hypotheses**	**Methodology**	**Analysis &Results**	**Conclusions**	**Implications for Future research**	**Implications For practice**	**Quality Assessment (Fineout-Overholt et al., 2010)**
Blount et al., 2019	Does utilizing the Eat, Sleep, Console method as opposed to the Finnegan Neonatal Abstinence Scoring System reduce length of stay and/or morphine use in infants with NAS?	Quality Improvement Methodology	Length of Stay decreased. Morphine use decreased.	Utilizing the Eat, Sleep, Console method over the modified Finnegan Scoring System decreased average length	Long term studies to determine developmental outcomes are lacking.	The particular use of PRN as opposed to scheduled morphine doses allowed for faster weaning and less doses in the researchers' opinion.	VI

				of stay and reduced morphine administration in infants with NAS.			
Curran et al., 2020	Does transitioning from the Finnegan Scoring System (FNAS) to the Eat Sleep Console (ESC) method impair infant care?	Retrospective cohort study	The FNAS was 94.8% sensitive and 63.5% specific for pharmacologic treatment while the ESC proxy variables were 99.4% sensitive and 40.2% specific.	The ESC proxy variables had higher sensitivity than FNAS scores. Transitioning to ESC from FNAS is not likely to negatively impact care.	Prospective studies may be able to analyze the prevalence of pharmacologic measures due to ESC's focus on nonpharmacologic methods.	This study supports the use of ESC and suggests the ESC method may be more sensitive to infants' symptomatology than FNAS.	IV

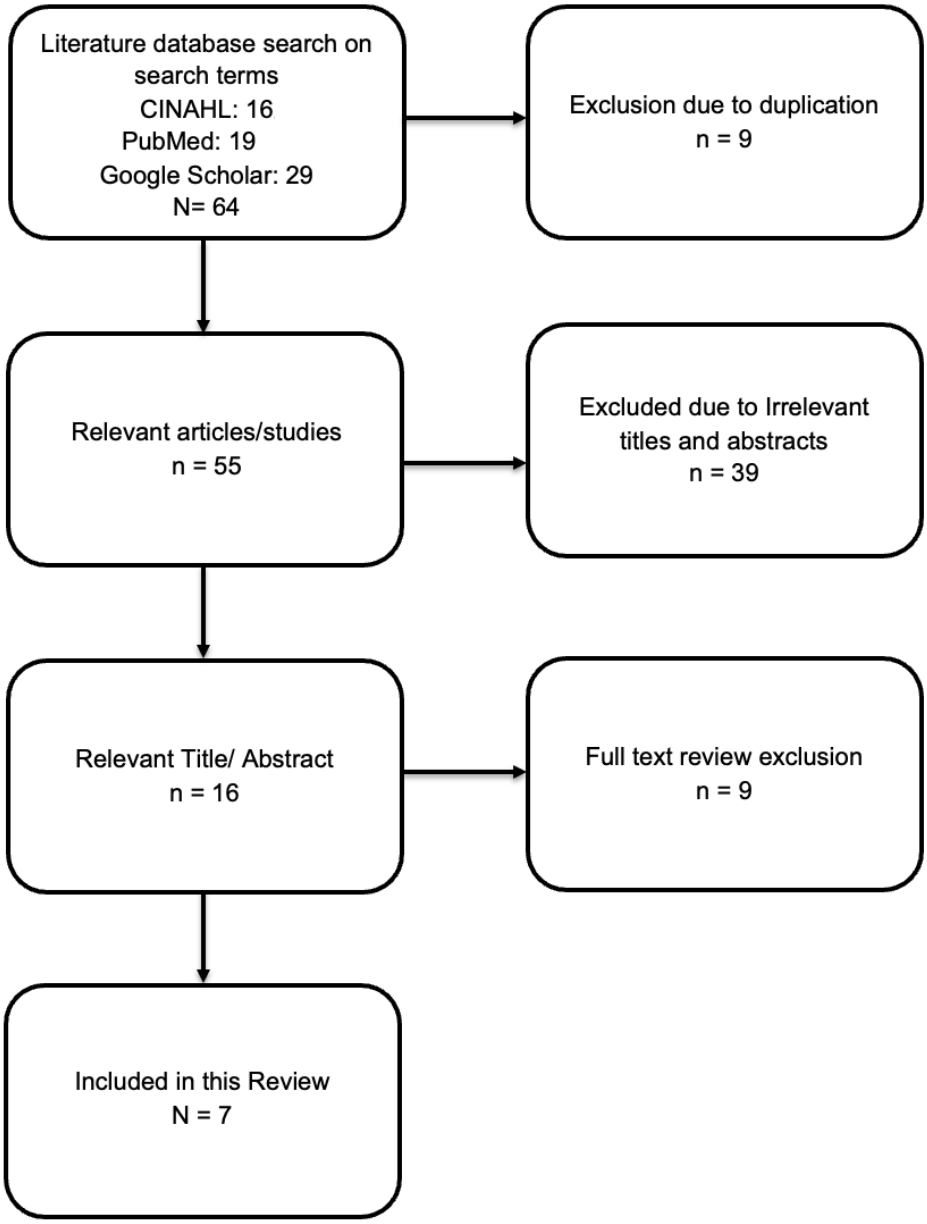
Grossman et al., 2018	Does ESC method decrease use of morphine when compared to the FNASS approach?	Retrospective	Using FNASS 31 infants were treated with morphine while in ESC on 6 were.	ESC is an effective approach to treating NAS with decreased morphine doses in the NAS population when compared to FNASS.	Does ESC impact length of stay in addition to lowering pharmacologic use of morphine?	ESC may decrease use of pharmacologic treatment of morphine compared to FNASS.	V
Hein et al., 2020	Does utilizing the Eat, Sleep, Console method as well as buprenorphine instead of morphine decrease NICU admission and reduce need for pharmacotherapy?	Quality Improvement Methodology	Admission to the NICU went down 22% and the pharmacologic treatment decreased by 50%. Treatment length utilizing pharmacotherapy also	Implementing ESC and changing therapy to buprenorphine had positive effects on	Further research into monotherapy with buprenorphine to evaluate efficacy of the treatment	Successful implementation of ESC reduced NICU admission and changing to buprenorphine from	VI

			decreased from 14 to 6.5 days.	patient care for infants with NAS by reducing admission to the NICU and decreasing days of therapy involving medication.	in place of morphine.	morphine may reduce length of treatment.	
Miller & Willier, 2021	Does using the ESC model to treat infants with opioid withdrawal decrease length of stay and the number of infants who receive morphine?	Retrospective medical review 12 months before and 12 months after ESC implementation.	LOS (length of stay) decreased from 17.7 days to 5.9 days mean. Morphine doses decreased. Breastfeeding rates increased.	Implementing the ESC method decreased LOS and decreased morphine doses while also increasing	Studies that follow infants long-term would be necessary to determine developmental implications and outcomes.	ESC method decreased infant LOS and morphine doses that infants received and also increased breastfeeding rates. This could have greater implications	V

				breastfeeding rates.	There's a greater need to further analyze breastfeeding rates with ESC.	for mother/baby bonding using ESC over traditional methods.	
Ryan et al., 2021	ESC scores correlate with FNASS scores but ESC will reduce health care use in NOWS patients.	Retrospective cohort study	ESC scores correlated with the FNASS scores. In addition, post ESC implementation LOS, duration of pharmacologic treatment also decreased.	The scores between ESC and FNASS correlated suggesting that scoring would be equal however ESC was correlated with reduced healthcare use.	Prospective and long-term studies could help in bolstering the findings of this study.	The ESC model appears to result in similar monitoring of symptoms but more efficient and effective management of NOWS.	IV

Wachman et al., 2018	Does a comprehensive QI program implementing ESC from Finnegan and methadone from morphine improve outcomes for patients?	QI methodology	Pharmacologic, LOS, days of opioid treatment, and total hospital charges all decreased after implementing the ESC Tool and methadone use.	Implementation of ESC tool set and changing to methadone medication had significant improvements for NAS outcomes.	Prospective and randomized controlled studies would bolster these findings.	ESC and methadone use appear to have significantly positive outcomes for infants with NAS.	VI

Figure 1.


Literature database search on search terms
CINAHL: 16
PubMed: 19
Google Scholar: 29
N= 64
Exclusion due to duplication
n = 9
Relevant articles/studies
n = 55
Excluded due to Irrelevant titles and abstracts
n = 39
Relevant Title/ Abstract
n = 16
Full text review exclusion
n = 9
Included in this Review
N = 7

Appendix

Blount, T., Painter, A., Freeman, E., Grossman, M., & Sutton, A. G. (2019). Reduction in Length of Stay and Morphine Use for NAS With the "Eat, Sleep, Console" Method. *Hospital pediatrics*, *9(8)*, 615–623. https://doi.org/10.1542/hpeds.2018-0238

This article describes a quality improvement project at a tertiary-care academic medical center. The primary research questions the authors wished to answer was, “Does utilizing the Eat, Sleep, Console method, as opposed to the Finnegan Neonatal Abstinence Scoring System, reduce the length of stay and morphine use in infants with NAS?” By implementing Eat, Sleep, Console when they had previously utilized Finnegan the author’s noted a statistically significant reduction in length of stay and in morphine doses. This article is also noteworthy as the authors point out that utilizing PRN vs schedule morphine may have allowed them to wean the neonates faster

Curran, M., Holt, C., Arciero, M., Quinlan, J., Cox, D., & Craig, A. (2020). Proxy Finnegan Component Scores for Eat, Sleep, Console in a Cohort of Opioid-Exposed Neonates. *Hospital pediatrics, 10(12)*, 1053–1058. https://doi.org/10.1542/hpeds.2020-0190

This article discusses how the authors used a retrospective cohort study to determine if transitioning from Finnegan Scoring System (FNAS) to Eat, Sleep, Console (ESC) method impaired an infant’s care. Specifically, the authors studied which method had higher sensitivity to aid in neonatal treatment. Overall, the author’s found ESC to be more sensitive. They thus conclude that transitioning to ESC would be very unlikely to cause harm to the patients as it might be easier to identify and treat neonates who have abstinence withdrawal syndrome.

Grossman, M. R., Lipshaw, M. J., Osborn, R. R., & Berkwitt, A. K. (2018). A Novel Approach to Assessing Infants With Neonatal Abstinence Syndrome. *Hospital pediatrics, 8(1), 1–6*. https://doi.org/10.1542/hpeds.2017-0128

This article sought to answer the question Does ESC decrease the use of morphine compared to FNAS? Using a retrospective study they compared 50 consecutive opioid-exposed infants within the Yale New Haven Children's Hospital. The author's found that when using FNAS 31 infants were treated with morphine while only 6 were treated with morphine using ESC. This suggests that by utilizing ESC that there will be less intervention with morphine. This article however, did not go on to analyze how the decrease in pharmacology might impact the length of stay.

Hein, S., Clouser, B., Tamim, M. M., Lockett, D., Brauer, K., Cooper, L., & Cleveland, L. (2021). Eat, Sleep, Console and Adjunctive Buprenorphine Improved Outcomes in Neonatal Opioid Withdrawal Syndrome. *Advances in Neonatal Care (Lippincott Williams & Wilkins), 21(1), 41–4*8. https://doi-org.libaccess.sjlibrary.org/10.1097/ANC.0000000000000824

This article used a quality improvement methodology to explore the hypothesis that ESC as well as buprenorphine would decrease admission to the NICU when compared to FNAS and morphine use. The authors found that by implementing ESC and buprenorphine therapy the admission rate of neonatal abstinence patients lowered. Days of therapy also decreased. This

article is unique because it is one of the few that explores buprenorphine vs morphine use while also exploring FNAS vs ESC methodology.

Miller, P. A., Willier, T., & Cleveland, L. (2021). Baby STRENGTH: Eat, Sleep, Console for Infants With Neonatal Abstinence Syndrome. *Advances in Neonatal Care (Lippincott Williams & Wilkins), 21(2), 99–106*. https://doi-org.libaccess.sjlibrary.org/10.1097/ANC.0000000000000840

This article sought to analyze whether and ESC model decreased length of stay and the total number of infants receiving morphine. It utilized a retrospective medical review 12 months before and 12 months after ESC implementation. This study was notable because not only did it find that the ESC method decreased length of stay and morhpine use, but it also increased breastfeeding rates. This is the only study that tracks breastfeeding rates. This could have greater implications for mother/baby bonding using ESC over traditional methods.

Ryan, K., Moyer, A., Glait, M., Yan, K., Dasgupta, M., Saudek, K., & Cabacungan, E. (2021). Correlating Scores but Contrasting Outcomes for Eat Sleep Console Versus Modified Finnegan. *Hospital pediatrics*, *11*(4), 350–357. https://doi.org/10.1542/hpeds.2020-003665

This study sought to compare whether ESC scores would correlate to FNASS scores. In this way the authors sought to explore if infants with opioid withdrawal would score similarly on the ESC and FNASS methods. They found that the scores did correlate to each other. Meaning an infant would score similarly for both systems. However, the authors then further explored the

treatment that infants with correlating scoring received. ESC was correlated with reduced healthcare use. This suggests that ESC has similar monitoring as FNASS but was more efficient in its treatment of neonatal abstinence withdrawal. This has implications not only in health care usage but cost and length of stay.

Wachman, E. M., Houghton, M., Melvin, P., Isley, B. C., Murzycki, J., Singh, R., Minear, S., MacMillan, K. D. L., Banville, D., Walker, A., Mitchell, T., Galimi-Hayes, R., Jorgensen, S., Gomes, D. R., Hodgins, F., Whalen, B. L., Diop, H., & Gupta, M. (2020). A quality improvement initiative to implement the eat, sleep, console neonatal opioid withdrawal syndrome care tool in Massachusetts' PNQIN collaborative. Journal of Perinatology, 40(10), 1560–1569. https://doi-org.libaccess.sjlibrary.org/10.1038/s41372-020-0733-y

This article follows a QI program that implemented ESC and methadone use when they had previously used FNAS and morphine. This QI methodology sought to explore if this change would decrease pharmacology, length of stay, and decrease days of opioid treatment. They found changing both to ESC and to methadone did indeed decrease all of the above which also decreased overall hospital charges to treat an infant with opioid withdrawal. This was the only article that explored methadone use over morphine use. This is notable as the other article that explored buprenorphine use also found positive outcomes over morphine.