Implementation of Eat, Sleep, Console Approach to Care for Opioid Exposed Newborns

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Abstract

Problem: Rates of neonatal abstinence syndrome (NAS) have seen a fivefold rise in Maryland. Current management strategies include the Finnegan Neonatal Abstinence Scoring System (FNASS) and opioid pharmacotherapy for symptom management placing tremendous burden on health care system due to increased length of stay, admission to special care nurseries, and disruptions to family bonding. **Purpose:** The purpose of this quality improvement project was to implement the "Eat, Sleep, Console" (ESC) method in the care of newborns with in-utero opioid exposure to reduce average length of stay (ALOS) for infants with NAS. Secondary outcomes were reduced doses and amount of morphine and increased breastfeeding initiation rates. **Methods:** A quality improvement (QI) methodology was used to implement ESC on an inpatient floor. Hospital NAS policy was revised to adopt ESC tool, as needed morphine for symptoms management, and emphasis on nonpharmacologic care. The ESC assessment tool was integrated into the electronic health care record (EHR). ESC scores, nonpharmacologic interventions, and parental presence were recorded in the EHR. Infants ≥ 32 weeks gestation with opioid exposure were included in the QI project. Data to be collected included average length of stay (ALOS), number and total morphine doses, and breastfeeding rates during admission. **Preliminary Results:** Evidence shows that organizations that have made the transition to ESC have seen reduction in opioid agonist therapy, reduced length of stay, and improvement in breastfeeding initiation rates for newborns with NAS. We aim to demonstrate that implementing the ESC will result in similar benefits to our institution. Updates to several structure and process measures are now in the implementation phase. **Preliminary Conclusions:** Changing the treatment model for newborns with NAS requires a multidisciplinary approach with providers across various specialties. Success of this Quality Improvement project required buy in from all units/care providers with education throughout the staff and families to support ESC.

Introduction

The opioid epidemic has experienced a dramatic rise since 1999, with a parallel increase in rates of opioid use in pregnancy (CDC, 2019). Every 15 minutes a baby is born with neonatal abstinence syndrome (NAS), translating to nearly 100 babies per day and $1.5 billion annually in hospital costs (CDC, 2019). Chronic exposure to maternal opioids in utero is associated with NAS, a constellation of symptoms including gastrointestinal, autonomic, and central nervous system disturbances (Wexelblatt et al, 2018). Management for newborns with NAS includes initiating pharmacologic interventions, such as morphine or methadone, often resulting in admission to special care nurseries and neonatal intensive care units, disruptions to family bonding and prolonged length of hospital stay (LOS).

Maryland has seen fivefold increase in rates of NAS to 14.1 per 1,000 newborn hospitalizations, twice the national rate (HCUP Fast Stats – Neonatal Abstinence Syndrome, 2019) with average LOS for NAS 11 days compared to two days for other newborn hospitalizations ("Data and Statistics", 2019). In response, the Maryland Patient Safety Center (MPSC) began a two-year initiative to identify evidence-based strategies to improve outcomes and quality of care for infants with NAS and reduce LOS, reduce 30-day readmissions, and decrease transfers to higher levels of care (Standardizing Care and Treatment, n.d.).

The Eat, Sleep, Console (ESC) method is a new approach that assesses functional abilities of the newborn exposed to opioids in utero. In this approach, inability of the newborn to perform essential functions (eating and sleeping) are identified as needing interventions (nonpharmacologic then pharmacologic) to manage symptoms and support newborn withdrawal. The purpose of this quality improvement project was to implement and evaluate the ESC Approach for newborns with opioid exposed newborns in a community hospital.

Literature Review

Updates in care models for newborns with NAS have demonstrated that approaches to care supporting functional behaviors of the newborn improve both the quality of care for families as well as length of stay, pharmacologic needs, and overall hospital costs (Wachman, Schiff, & Silverstein, 2018). Interventions supporting a functional approach include revisions to the assessment tools, rooming in to support family support, and improving breast feeding rates.

Assessment scores for withdrawal drives the decision on when to initiate pharmacologic care, including when to adjust or discontinue medication. Although the Finnegan scoring system has traditionally been the gold standard for assessment, its cutoff score of > 8 has not been validated and has wide interrater reliability (Jones et al., 2016). Limitations with the Finnegan scoring tool have resulted in the search for alternative assessment tools (Schiff &Grossman, 2019; Sanlorenzo et al., 2018). Several studies have compared abbreviated or modified FNAS (Volpe et al, 2016; Wachman et al., 2018), or prioritized symptoms (Devlin et al., 2020) showing simplification in assessment tool and enhanced utility. Use of the FNAS is improved with staff training and experience (Clark, 2019), and modification can improve reliability. Prioritization of certain symptoms such as sleeping and feeding from the Finnegan scale was associated with decrease pharmacologic rates (Volpe et al., 2016, Wachman et al, 2018). Several quality improvement (QI) projects have found that functional based assessments including the ESC tool reduce the number of infants who receive pharmacologic treatment without increase risk of adverse effects (readmission rates, seizures) (Dodds et al., 2019; Grossman et al, 2018; Grossman et al, 2017; Wachman et al, 2018; Achilles & Castaneda-Lovato, 2019; Blount et al, 2019). Although review of the ESC assessment tool has been restricted to quality improvement and small cohort studies, results are promising in that there is benefit to the mom-baby dyad without increased requirements of hospital requirements (level IV-VI).

Parental involvement in newborn care, often in the form of rooming in, has been associated with improved outcomes in the care of neonates with NAS (Achilles & Castaneda-Lovato, 2019; Boucher, 2017; Cree et al., 2019; MacMillan et al., 2018; McKnight, et al., 2015; Singh et al., 2020; Volpe et al., 2016). Parental participation in care is associated with decreased NAS scores, lower initiation and duration of pharmacotherapy, shorter length of stay, and increased breastfeeding initiation rates (Singh et al., 2020; Howard et al., 2017; Macmillan et al., 2018). Rooming in provides opportunities for skin-to-skin time, breastfeeding and improved parental soothing techniques, which are known to lessen NAS symptoms (MacMillian et al., 2018). Parental involvement was associated with decreased pharmacologic therapy when compared to standard care (MacMillan et al., 2018), lower rates of NICU admission (Cree et al (2019) and is central to reduced use of resources supporting newborn withdrawal (Volpe et al, 2016). Involving parents in education classes on caring for their newborn increased parental involvement (Achilles & Castaneda-Lovato, 2019). Rooming in can be implemented across diverse settings, allowing for greater parental involvement and more efficient use of hospital resources (moderate quality of evidence IV-VI).

Nonpharmacologic management of NAS, often encompassing breastfeeding, swaddling, reduced environmental stimulation, and skin to skin care has been associated with less severe NAS, whether used alone or in combination with pharmacologic therapy (Ryan et al., 2018). Breastfeeding has been associated with decreased lengths of pharmacologic therapy and hospital stay compared to exclusively formula fed infants (Favara et al., 2019). Modifying environment (dim, quiet rooms, positioning) are commonly used to prevent hyperstimulation of hyper aroused infants. Several clinical trials are currently underway to assess efficacy of nonpharmacologic interventions (Pahl et al, 2020).

Theoretical Framework

Nursing care for the neonate experiencing NAS includes assessment and evaluation of withdrawal symptoms in order to determine if and when pharmacologic therapy needs to be initiated. Non-pharmacologic interventions such as swaddling, rocking, nutritive and non-nutritive sucking, skin to skin, and creating a soothing environment should be prioritized given they are low cost, are not associated with risky side effects, are accessible and acceptable, and promote maternal-newborn bonding. Promoting and maintaining a level of comfort for the newborn reduces irritability and excessive crying, promotes successful feeds and sustained sleep cycles, and conserves energy for newborns. Provision of comfort has long been recognized as a primary focus of nursing care, dating back as far as Nightingale's *Notes on Nursing* which references nursing's role to enhance physical and mental comfort to achieve optimal health (Nightingale, 1860). Kolcaba's Theory of Comfort has been selected as the middle range theory for this project. According to the theory, the comfort of patients is a priority outcome of nursing care (Kolcaba, 1994) to assist in the individual in achieving a higher level of health, defined as optimal functioning.

Central to the ESC approach is supporting essential newborn functions by providing parental presence, comfort, and relief of withdrawal symptoms. A primary intervention of QI project was teaching healthcare providers how to support families in providing nonpharmacologic interventions for their newborns including skin to skin time, swaddling, rocking, and breastfeeding. Nurses must be able to evaluate patient's comfort needs and response to interventions. Education regarding the ESC approach included how to assess the newborn for withdrawal symptoms, supporting "normal" newborn behavior, nonpharmacologic care, and when pharmacotherapy would be indicated. Newborn discomfort, as evidenced by an inability to

eat, sleep, console, drives nursing interventions rather than placing newborns on a nurse driven schedule. A significant difference between the ESC and the FNAS tool previously used for management of symptoms is the ability to allow newborns to function on their own schedule rather than a nurse driven schedule. By providing family centered care and prioritizing family as the essential intervention, there is a reduction in disruption to family boding and transcendence to healthier family units.

Methods

The institution is a tertiary care hospital that is part of a large academic medical system with ~1100 deliveries per year and ~ 60 newborns with known in utero opioid exposure. Newborns ≥ 32 weeks' gestation with in-utero opioid exposure undergo toxicology screening through urine and meconium. Infants are monitored for withdrawal signs and symptoms through Finnegan Neonatal Abstinence Syndrome (FNAS) tool every 3 to 4 hours and 30 minutes after feeding. Nonpharmacologic strategies such as comfort care are utilized along with FNAS. Scores ≥ 9 are repeated in one hour and if remain ≥ 9 the infant is transferred to the special care nursery for initiation of morphine therapy with cardiorespiratory (CR) monitoring. Weaning may begin when scores remain < 9 for a minimum of 48 hours by set increments with continued FNAS for 24 hours. Mothers who are discharged before the newborn may room in if space allows, with the newborn transferred to the pediatric unit.

We developed a multidisciplinary implementation team including physicians (pediatrician), nurse manager, pediatric nurse educator, and nursing champions (labor and delivery, mother-baby, and pediatrics) to revise the NAS management policy. Additional

members contributing to the QI project included lactation consultants, social worker, pharmacist, marketing and communications, nurse educator, and IT specialists.

Baseline data was obtained from January 2020-August 2020 and included number of newborns admitted with in utero opioid exposure, length of stay, pharmacologic therapy, breastfeeding initiation, and adverse events including readmission, seizure, transfer to higher acuity care. The MAP IT framework was utilized to organize the QI project. Two primary changes to newborn care for opioid exposure were implemented. First, the NAS Treatment Management policy was revised to include assessment for withdrawal symptoms through the "Eat, Sleep, Console" approach and adopting an as-needed (PRN) dosing of morphine 0.03 mg/kg for infants with NAS symptoms not controlled with non-pharmacologic approaches (Fig 1). In order to increase nonpharmacologic care as the initial approach to management, nurses reviewed with parents a welcome letter outlining NAS, nonpharmacologic approaches, and morphine for management (Fig 2). The EHR was updated to include the ESC assessment form (Fig 3), order set with PRN morphine dosing (Fig 4), and nurse education (Fig 5). Parents were provided with a newborn care diary (Figure 6) to document nonpharmacologic interventions and newborn ESC score. A guideline for providers and nurses was created and provider and nurse champions were trained to be on site resources for staff. In order to update all staff with changes to the care approach for NAS, a PowerPoint (Fig 7) was created and included as part of mandatory staff education to be completed. Prior to implementation, staff completed a questionnaire regarding NAS beliefs and best practices on care of the newborn and family with substance abuse (Fig 8).

The primary outcome data for the QI project was average length of stay (ALOS) for infants with in-utero opioid exposure. Chart review of all infants known to have in utero opioid

exposure ≥ 32 weeks gestation were included. ALOS was defined as time from birth to discharge, transfer, or discontinuation of NAS assessment (FNAS or ESC). Secondary outcomes included number and amount of morphine doses received per infant and breastfeeding rates. Balancing measures included adverse events such as seizure, transfer to NICU, 30-day readmission rate, and percent weight change. Data was monitored through statistical process control charts.

Prior to implementation, the QI initiative was reviewed and the institutional review board determined that it did not meet criteria for human subjects. All newborns meeting criteria were included in the QI process and patient data was only shared with the implementation team.

Preliminary Results

Several barriers have delayed implementation of the QI project. COVID-19 pandemic required a change in focus for the hospital as it had to adjust to meeting new challenges for patient care. During the planning phase, several critical members of the implementation team left the organization to pursue other interests. This resulted in delays in moving proposed changes forward as a new team was assembled. Another delay included competing hospital priorities with a shift to update a newborn fall policy prior to moving forward with implementation.

Currently the ESC model is undergoing implementation in the institution. Beginning in April, all newborns ≥ 32 weeks at risk of NAS will be cared for using the revised policy. Similar QI projects implemented at other institutions have demonstrated length of stay and reduction in opioid replacement therapies (Dodds et al, 2019, Blount et al, 2019, Achilles & Castaneda-Lovato, 2019). Initially, a primary outcome data for this project was to reduce LOS for newborns under the ESC model of care. Review of the current policy has resulted in an update

to minimum length of stay up to 3-5 days given the delayed onset of presentation for different substances of abuse. This may result in increased average length of stay as we move to the longer observation period. A more appropriate outcome to assess effectiveness following implementation will be total pharmacologic doses.

In order to understand staff knowledge and beliefs regarding caring for the family with substance abuse, current therapies (pharmacologic and nonpharmacologic), as well as assessment for newborn withdrawal, a baseline survey was completed prior to implementation. The questions utilized were modified from a prior study by Romisher, Hill, & Cong (2018). Forty-two percent of surveyed staff responded that the best place for NAS care was in the NICU/special care nursery, yet 92% believe that they include families in the care plan demonstrating conflicting beliefs on how to care for families with opioid use in pregnancy. All respondents reported utilizing multiple nonpharmacologic interventions including rocking/swaying, skin to skin care, swaddling, decreased simulation, and feeding on demand. Sixty-five percent of staff state they consider circumstances surrounding the mother's substance abuse when caring for them and their families.

Discussion

Our hospital was able to successfully develop and is currently implementing a new approach to NAS care by integrating the ESC model. Using a multi-disciplinary approach, we have modeled interventions that have shown success at other institutions with a shift to PRN morphine, rooming in, and prioritizing nonpharmacologic care to support ESC. An emphasis in care models to support Family Centered Maternity Care and Baby Friendly Initiatives (BFI) supports the need to reassess how we care for newborns with NAS. This QI project replicated previous methods discussed in the literature to improve care for NAS. Several process and

structure measures were changed to fully integrate the ESC model. Grossman et al (2017) first introduced the use of morphine as needed in a QI project that resulted in no adverse effects or readmissions. Transitioning to morphine PRN allows the newborn to room in, given the prior protocol requires admission to nursery and a weaning protocol that could span days. MacMillan et al (2018) demonstrated that rooming in is associated with decreased length of stay and pharmacologic needs. Holmes et al (2016) compared rooming in to NICU admissions and saw similar benefits to LOS and decreased pharmacologic treatment. Rooming in allows for caregivers to attend to baby cues early in the withdrawal process and implement non pharmacologic techniques to support newborn transitioning. Collaborating with the pediatrics unit provided parents the option to continue to room in and provide continued parental presence, although this limits generalizability to other institutions. Implementing the ESC assessment tool into the EHR has resulted in complete shift away from FNASS as well as support long term sustainability and a method for ongoing evaluation implementation success.

This QI project also demonstrated the role of positive messaging of parental involvement as a primary treatment for NAS. Romisher et al. (2018) reported on nurses' perceptions in caring for infants with NAS. Nurses report stress when caring for infants with NAS due to multiple challenges including numerous assessments, medication management, and tense relationships with the family due to judgment and frustration when working with a mother with a substance abuse disorder. Conversely, families have reported feelings of judgment and blame from staff caring for their newborn along with a lack of understanding regarding substance abuse. Although the baseline results of our survey suggest that nurses perceive their actions as inclusive of families and understanding of substance use disorder, we have not completed a post implementation assessment and have not interviewed families on their experiences in the health

care system. Patient education documents will now be included in the new patient packets provided to families on admission, continuing to reinforce family involvement.

There are several limitations to this QI project. An initial objective of the ESC approach was to reduce length of stay for newborns with NAS by reducing the need for opioid agonist therapy to support withdrawal symptoms. While in the planning phase of the QI project, the hospital system identified a priority project that delayed moving forward with updates to ESC. With concerns of an increased risk of newborn falls due to rooming in and patients receiving opioid agonist treatment, the focus of the unit shifted to review and update of the newborn fall policy. This resulted in a delay in updating the EHR with ESC assessment tool and policy committee approval.

Patient education is a necessary component of family centered care. Hanna, et al (2021) reported on a QI project to improve parental knowledge regarding NAS in the antepartum stage through provider counseling and education materials. In our QI project, parental education was provided at the time of admission delivered by their primary nurse. A future project would be to extend education into the prenatal sites to increase family understanding and involvement in newborn care.

Conclusion

This QI project has important implications for care of infants with NAS. It demonstrated that non-pharmacologic interventions can be prioritized into care models for NAS. We were able to demonstrate that a large multi-disciplinary QI project can be implemented across multiple units. It demonstrated the importance for family education to fostering a partnership in newborn care with staff and family. Family involvement during admission potentially results in improved maternal self-confidence, maternal-newborn attachment, and breastfeeding rates. Additionally,

staff collaboration with families can improve staff knowledge and perceptions of substance abuse disorders translating to improved relationships. Similar QI projects implementing nonpharmacologic care models (rooming in, breastfeeding, implementing ESC) have seen reduction in length of stay, total pharmacologic treatment, increase in breastfeeding initiation, and decreased cost of care. This QI project could be generalized to similar institutions looking to improve care outcomes for newborns with NAS. A benefit at our hospital included the ability to support rooming in for our families which may be limited at other institutions.

Care of the patient with substance abuse requires a multidisciplinary approach, with collaboration between obstetric and pediatric care providers, social work, substance use specialists, and family. Given the prolonged effect of NAS weeks to months after delivery, continued support for families is needed. Although we were unable to report of outcomes following implementation at our hospital at this time, this QI project has allowed for reassessment of our institutions approach to care of families with substance abuse disorder.

References

Achilles, JS, & Castaneda-Lovato, J. (2019). A quality improvement initiative to improve the care of infants born exposed to opioids by implementing the eat, sleep, console assessment tool. Hospital Pediatrics, 9(8), 624-631. DOI: 10.1542/hpeds.2019-0144

Behnke, M., Smith, V. (2013). Prenatal Substance Abuse: Short- and long-term effects on the exposed fetus. Pediatrics, 131, 3: e1009-e1024.

Boucher, AM. (2017). Nonopioid management of neonatal abstinence syndrome. Advances in Neonatal Care. 17 (2): 84-90.

Clark, A. (2019). Effect of a neonatal abstinence syndrome training program on nurses' confidence and ability to use the Finnegan Scoring Tool. Nursing for Women's Health. 23(6): 485-493.

Cree, M., Jairath, P., May, O. (2019). A hospital-level intervention to improve outcomes of opioid exposed newborns. Journal of Pediatric Nursing. 48: 77-81.

Crook, K., Brandon, D., (2017). Prenatal breastfeeding education: Impact on infants with neonatal abstinence syndrome. Advances in Neonatal Care. 17(4): 299-305.

Community Health Needs Assessment (CHNA). (2019). Retrieved https://www.aahealth.org/wp-content/uploads/2019/02/CHNA2019.pdf

Data and Statistics About Opioid Use During Pregnancy. (2019). Retrieved from https://www.cdc.gov/pregnancy/opioids/data.html

Devlin, L., Breeze, J., Terrin, N., Gomez Pomar, E., Bada H., Finnegan, L., O'Grady, K., Jones, H., Lester, B., Davis, J. (2020). Association of a simplified Finnegan neonatal abstinence scoring tool with the need for pharmacologic treatment for neonatal abstinence syndrome. JAMA network open. 3(4)

Dodds, D, Koch, K, Buitrago-Mogollon, T, & Horstmann, S. (2019). Successful implementation of the eat sleep console model of care for infants with NAS in a community hospital. *Hospital Pediatrics. 9 (8),* 632-638. DOI: 10.1542/hpeds.2019-0086

Favara MT., Carola D,. Jensen, E., Cook, A, Genen, L, Dysart, K., Greenspan, JS, Aghal, ZH. (2019). Maternal breast milk feeding and length of treatment in infants with neonatal abstinence syndrome. Journal of Perinatology. 39(6): 876-882.

Finnegan LP, Connaughton JF, Jr, Kron RE, & Emich JP. Neonatal abstinence syndrome: assessment and management. Addict Dis. 1975;2(1-2):141–158

Grossman, M., Berkwitt, A., Osborn, R., Xy, Y., Esserman, D., Shapiro, E., & Bizzarro, M. (2017). An initiative to improve the quality of care of infants with neonatal abstinence syndrome. Pediatrics, 139 (6), DOI: 10.1542/peds.2016-3360.

Grossman, M., Lipshaw, M., Osborn, R., Berkitt, A. (2018). A novel approach to assessing infants with neonatal abstinence syndrome. Hospital Pediatrics. 8(1): 2154-1671.

Hanna, I., Marwa, M., Eiges, A., Sharma, P., Shukla, S., Cortex, J., Hudak, M. (2021). A Quality Improvement Project to Increase Parental Knowledge About Neonatal Abstinence Syndrome. Pediatrics March 2021, 147 (3 MeetingAbstract) 677-678; DOI: https://doi-org.proxy-hs.researchport.umd.edu/10.1542/peds.147.3_MeetingAbstract.677

Howard, MB., Schiff, DM, Penwill, N., Si, W., Rai, J., Wolfgang, T., Moses, JM., Wachman, EM. (2017). Impact of parental presence at infants' bedside on neonatal abstinence syndrome. *Hospital Pediatrics, 7 (2),* 63-69. DOI:10.1542/hpeds.2016-0147

HCUP Fast Stats. Neonatal Abstinence syndrome (NAS) Among Newborn Hospitalizations b. (December 2019). Retrieved from https://www.hcup-us.ahrq.gov/faststats/NASServlet?radio-2=on&location1=MD&characteristic1=02C11&location2=US&characteristic2=02C11&expansionInfoState=hide&dataTablesState=hide&definitionsState=hide&exportState=hide

Jones, HE, Seashore, C., Johnson E, et al. Psychometric assessment of the Neonatal Abstinence Scoring System and the MOTHER NAS scale. Am J Addict 25(5): 370-373.

Kolcaba, K. (1994). A theory of comfort for nursing. Journal of Advanced Nursing, 19, 1178 1184

MacMillan,K., Rendon, C., Verma, K., Riblet, N., Washer, D., & Volpe-Holmes, A. (2018). Association of rooming-in with outcomes for neonatal abstinence syndrome: A systematic review and metanalysis. *JAMA Pediatrics, 172(4),* 345-351. DOI 10.1001/jamapediatrics.2017.5195

McKnight, S., Coo, H., Davies, G., Holmes, B., Newman, A., Newton, L., Dow, K. (2016). Rooming in for infants at risk of neonatal abstinence syndrome. *Am J Perinatology, 33*, 495-501. DOI: 10.1055/s-0035-1566295

McQueen, K., Taylor, C., Murphy-Oikonen,J. (2019). Systematic review of newborn feeding method and outcomes related to neonatal abstinence syndrome. JOGNN, 48 (4): 398-407.

Nightingale F. *Notes on Nursing: What it is and What it is not*. London, UK: Harrison; 1860:59.

Pahl, A., Young, L., Buus-Frank, M.E., Marcellus, L., & Soll, R. (2020). Non-pharmacolgoical care for opioid withdrawal in newborns. The Cochrane Database of Systematic Reviews, 12, CD013217. https://doi.org/10.1002/14651858.C013217.pub2

Piteau, S,, Vyas, M., Papadakos, P. (2021). Reduction of Need for Treatment and Length of Hospital Stay Following Institution of a Neonatal Abstinence Syndrome Rooming-in Program Pediatrics March 2021, 147 (3 MeetingAbstract) 54-55; DOI: https://doi-org.proxy-hs.researchport.umd.edu/10.1542/peds.147.3_MeetingAbstract.54-a

Ryan, G., Dooley, J., Gerber Finn, L., & Kelly, L. (2019). Nonpharmacological management of neonatal abstinence syndrome: a review of the literature. The Journal of Maternal-Fetal & Neonatal Medicine: The Official Journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians, 32(10), 1735-1740. https://doi.org/10/1080/14767058.2017.1414180

Standardizing Care and Treatment of Neonatal Abstinence Treatment. (n.d.). Retrieved from https://www.marylandpatientsafety.org/NeonatalAbstinence.aspx

Schiff, DM, Grossman, MR. (2019). Beyond the Finnegan scoring system: Novel assessment and diagnostic techniques for the opioid-exposed infant. Seminars in Fetal and Neonatal Medicine. 24: 115-120.

Sanlorenzo, LA., Stark, AR.Patrick, S., (2018). Neonatal abstinence syndrome: An update. Current Opinion Pediatrics. 30(2): 182-186.

Sing, R., Rothstein, R., Ricci, K., Visintainer, P., Shenberger,J., Attwood, E., Friedmann, P. (2020). Partnering with parents to improve outcomes for substance exposed newborns – a pilot program. Journal of Perinatology. 40: 1041-1049.

Volpe Holmes, A., Atwood E., Whalen, B., Beliveau J., Dean Jarvis, J. Matulis, J, Ralston, S. (2016). Rooming-in to treat neonatal abstinence syndrome: Improved family centered care at lower cost. Pediatrics. 137(6). DOI 10.1542/peds.2015-2929.

Wachman, E, Grossman, M, Schiff D, Philipp, B., Minear, S. et al. (2018). Quality improvement initiative to improve inpatient outcomes for neonatal abstinence syndrome. Journal of Perinatology. 38: 1114-1122.

Wexelblatt, S., Mcallister, J., Nathan, A., Hall, E. (2018). Opioid neonatal abstinence syndrome: An overview. Clinical pharmacology & Therapeutics. 103(6): 979-981. DOI 10.1002/cpt.958

TABLE 1 Evidence Table

Achilles, JS, & Castaneda-Lovato, J. (2019). A quality improvement initiative to improve the care of infants born exposed to opioids by implementing the eat, sleep, console assessment tool. Hospital Pediatrics, 9(8), 624-631. DOI: 10.1542/hpeds.2019-0144					IV
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
"reduce the proportion of newborns with neonatal abstinence syndrome who receive opioid medications for treatment of withdrawal symptoms" through implementation of ESC and increased prenatal education to families and providers regarding nonpharmacologic management	Single center pre and post intervention quality improvement Quality improvement PDSA Cycles PDSA1: prenatal education, maternal drug screening and newborn drug testing, education to improve interrater reliability of FNASS scoring and change schedule so as not to wake infant, emphasized non pharmacologic interventions (ie minimize stimulation, breast feeding, skin to skin), improved family engagement, provider education PDSA 2: pharmacologic treatments switched from methadone weaning protocol to morphine PRN	**Sampling Technique**: Convenience N= 85/2207 infants with in utero exposure (3.9%), 4 transferred out leaving 81 in baseline group Postintervention group – 104/2444 infants with in utero exposure (4.3%), four transferred out leaving 100 **Power Analysis:** No **Group Homogeneity:** maintained between the groups	Control: NA Prenatal education to families regarding NAS and hospital plan of care to improve family engagement Pharmacologic protocol from methadone weaning protocol to morphine PRN ESC training to staff and implemented into EHR Did not assess interrater reliability on ESC assessment	Proportion of newborns exposed to opioids requiring treatment with opioids Cumulative dose of opioids per exposed newborn requiring treatment (morphine equianalgesic conversion of 3.2/1) LOS for exposed newborns LOS for exposed newborns requiring opioids Direct cost per exposed newborn Direct cost per exposed newborn requiring opioids Rate of 30 day readmission related to NAS and death or NICU transfer within 30 days	Statistical procedures and results X2 or Fisher's exact tests and t tets or Wilcoxon rank 2 tailed value of P</= 0.05 as significant and presented 95% CI Postintervention group, more exposed infants received no opioid treatment at all (76% vs 69%, P< 0.0001) Total cumulative dose of opioids (methadone equivalents) was lower in postintervention group (0.2 mg vs 2 mg, P >0.0001) LOS was lower in the postintervention group (6.5 days vs 9 days, P=0.008) Total direct costs were lower in postintervention group ($5657 vs $7359, P = 0.48) All cause readmission rates within 30 days did not differed significantly (2% vs 3%, P=1.0) In infants requiring pharmacologic intervention, postintervention group had lower

	PDSA3: ESC assessment tool and implementation into HER				total cumulative dose in methadone equivalents (1.3 mg vs 6.6 mg, P <0.001) and shorter LOS (10.9 days vs 18.7 days, P=0.0005) Total direct costs were lower in postintervention group ($11936 vs $15039, P = 0.18)

Blount, T., Painter, A., Freeman, E., Grossman, M., & Sutton, A. (2019). Reduction in length of stay and morphine use for NAS with the "eat, sleep, console" method. Hospital Pediatrics, 9(8), 615-623. DOI:10.1542/hpeds.2018-0238					IV
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
"to reduce the ALOS for infants with NAS transferred to the inpatient floor by 50% in a 6-month period and to reduce the percent of infants with NAS receiving treatment with morphine by 50% and the total amount of morphine received by those infants treated with morphine by 50%."	Single center pre and post implementation Quality Improvement Baseline (6/2016-10/2017) and intervention and sustainment (11/2017-12/2018) data obtained weekly via automated reports from EHR on infants >/= 35 wks gestation and >/= 1.8 kg with 1 documented FNASS Included infants had documented scores in MIU of 2 FNASS scores >/=12 or 3 scores >/= 8 before transfer	**Sampling Technique**: convenience N= 389 (baseline n = 203, intervention n = 186) 76 infants (baseline n=40, intervention n – 36) with escalating NAS sx required transfer to inpatient floor and met criteria for inclusion. **Power Analysis:** No **Group Homogeneity:** post intervention group had higher maternal tobacco use	Control: chart review pre implementation Replaced use of FNASS scores for NAS with ESC method (fed 1 oz/adequate breastfeeding session, slept 1 hour between feedings, consoled within 10 minutes of crying PRN dosing of morphine at 0.03 mg/kg for infants with NAS symptoms not controlled by nonpharmacologic interventions.	Average length of stay (ALOS) for infants transferred to the inpatient floor (time of birth to discharge or discontinuation of ESC protocol) Total number of morphine doses during hospitalization (count) Total amount of morphine received during hospitalization (milligrams per kilograms) Percent of infants with NAS treated with morphine	Statistical process control charts – Standard Shewhart rules ALOS decreased from 10.3 d to 4.9 d Percentage of infants treated with morphine decreased from 92% to 19% Only 9% of infants with in-utero opioid exposure received pharmacotherapy postintervention. Decrease average number of morphine doses from 38 doses per infant to 0.3 doses per infant Average total morphine dosage per infant decreased from 1.1 to 0.03 mg/kg per infant

			Reeducation re nonpharmacologic interventions included reducing environmental stimulation, pacifier use, swaddling and increasing caloric density of formula.	Recorded adverse events, percent weight change from birth to discharge, 30 day readmission or ED presentation	During intervention period, 0 infants received scheduled morphine dosing an 1 infant received multiple doses of PRN morphine No NAS-attributable 30-day readmissions or ED visits No adverse events documented Decrease in average below birth weight from 3% to 5%

Boucher, AM. (2017). Nonopioid management of neonatal abstinence syndrome. Advances in Neonatal Care. 17 (2): 84-90.					V
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
Investigate efficacy of rooming in care and acupuncture as non pharmacologic adjunctive agents to reduce magnitude of postnatal opioid exposure and LOS	Literature review Utilized PubMed, Ovid, Medline, Embase, and CINHAL for studies on rooming in and acupuncture for NAS treatment	8 studies met inclusion	Rooming In Acupuncture	LOS Pharmacologic therapy	Rooming in was associated with decreased need for pharmacologic therapy (79.2% vs 88.7%) . When pharmacologic therapy was necessary, LOS was shorter and decreased exposure to opioid therapy. Rooming in resulted in shorter LOS for infants started on opioid therapy (27 d vs 32.5) and shorter mean LOS 33 vs 41.4)

Clark, A. (2019). Effect of a neonatal abstinence training program on nurses' confidence and abilitiy to use the Finnegan scoring tool. Nursing for Women's Health. 23(6): 485-493.					IV
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
Study impact of education training on NAS for accuracy and reliability of scoring by nurses	Pilot study, PDSA framework with pre and post test	Convenience sample of MBU (n=11), NICU (n=5), and pediatric (n=1) nurses	Education training session and follow up training 2-4 weeks after Neo Advance Inter Observer Reliability Training Program	Self confidence rating	Improvement in interobserver reliability from pretraining to postraining Increase confidence reported, Follow showed decline in interobsererver reliablity

Cree, M., Jairath, P., May, O. (2019). A hospital-level intervention to improve outcomes of opioid exposed newborns. Journal of Pediatric Nursing. 48: 77-81.					Quality Improvement
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
Determine if non pharmacologic strategies such as rooming in for newborns at risk of NAS would reduce LOS and need for pharmacologic therapy	Quality improvement, retrospective chart review	Records review of newborns with in utero methadone or buprenorphine exposure born between 1/2016 and -8/2017 at Wellspan York Hospital GA > 35 wks	Transition to rooming in for opioid exposed newborns vs those in newborn nursery	Length of stay Length of pharmacologic treatment Breastfeeding rates	LOS reduced from 14d-10.1 (p-0.014) Treatment decreased from 15.68d to 9.71 d (p=0.023) Admission to NICU dropped from 100% to 7.5%

Devlin, L., Breeze, J., Terrin, N., Gomez Pomar, E., Bada H., Finnegan, L., O'Grady, K., Jones, H., Lester, B., Davis, J. (2020). Association of a simplified Finnegan neonatal abstinence scoring tool with the need for pharmacologic treatment for neonatal abstinence syndrome. JAMA network open. 3(4)	VI

Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
Identify FNAST items independently associated with need for pharmacologic therapy	Retrospective medical record reviews of neonates with antenatal opioid exposure for infants born in 2014	GA > 36 weeks 533 neonates with opioid exposure			

Dodds, D, Koch, K, Buitrago-Mogollon, T, & Horstmann, S. (2019). Successful implementation of the eat sleep console model of care for infants with NAS in a community hospital. *Hospital Pediatrics. 9 (8),* 632-638. DOI: 10.1542/hpeds.2019-0086					Level Quality Improvement
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
"Improve the care of infants with NAS by transitioning from Finnegan Neonatal Abstinence Scoring System (FNASS) to Eat, Sleep, Console (ESC) model of care. Our goal was to decrease the average length of stay without increased readmission"	Quality improvement initiative	Sampling Technique: convenience # Eligible: 82 # Accepted: 74 # Control: 49 # Intervention: 33 **Power analysis**: not done **Group Homogeneity**: no significant difference between the two groups. Several patients were missing data on race and ethnicity and could not be included on this statistical comparison.	Control: Infants born exposed to opioids (identified prenatally or at delivery) are observed for 5 days in newborn nursery and scored by using FNASS. Infants with 2 FNASS ≥ 8 or 1 score ≥ 12 were moved to NICU were protocol was followed. Intervention: 5-day observation period was followed, however infants were screened by medical social worker for inclusion then transferred either to inpatient ward or NICU	DV: Average length of stay (ALOS), allocated variable cost per stay, total morphine use Measurement tool (reliability), time, procedure:	Statistical Procedures(s) and Results: SPC charts were used to evaluate outcomes. SPC rules to identify presence of special cause variation and 2 sample t test with unequal variance to attain significance of improvement SPC process measures were use of ESC assessment tool, breastfeeding rates ESC model was followed for 90% of postimplementation patient

			for treatment on the bsis of screening results. Inclusion for ESC group included gestational age ≥ 37 weeks, availability of bedside caregiver, an no comorbid illnesses requiring specialized care. Infants not meeting ≥ 1 of these criteria were transferred to NICU for treatment. Intervention fidelity (describe the protocol): Data collected on infants admitted to hospital from 1/2017 through 3/2018 pre-implementation (demographic information, in utero drug exposure, individual hospital course, LOS, allocated variable cost per stay, need for medication, frequency of medication administered, associated complications). Postimplementation analysis was performed on infants admitted to inpatient pediatric unit for treatment of NAS. Infants exposed to illicit drugs, prescription opioids, SSRI, EtOH, and nicotine were included.		ALOS, average variable cost per patient, and morphine use revealed special cause variation after mother and infant rooming in and starting ESC protocol 2 sample t test revealed decreased ALOS from 11.77 to 5.94 days (P=0.0003) Average variable cost per stay decreased by 48%, and cumulative amount of morphine used per stay decreased from 2.25 to 0.45 mg/kg (P=0.001). Breastfeeding rates were not impacted. Transition from FNASS to ESC was not associated with compromised safety or quality of care

			Manual chart audits from April 2018 to February 2019 Intervention 1: Changing location of care for infants with NAS from any nursery to inpatient unit to allow for rooming-in and increased caregiver involvement at the bedside. Toolset was created for caring for these infants and inpatient nursing staff educated on FNASS. Intervention 2: Change from FNASS to ESC model (infant's ability to bottle or breast feed effectively, sleep undisturbed for > 1 hour between feeds, console within 10 minutes). FNASS and ESC scoring done concurrently for first month of implementation on every patient to build familiarity. ESC tool used exclusively thereafter. Score of ≥ 2 was effectively managed withdrawal and a score of ≤ 1 was indicative of withdrawal requiring medication.		

			Nonpharmacologic interventions were administered (ie rocking, swaddling, singing, cooing) and if ineffective, morphine administered. Parental (or identified caregiver) presence was strongly encouraged and volunteers used when unavailable. Monthly data collection for infants admitted for NAS through manual chart reviews from 4/2018 to 2/2019.		

Favara, M., Crola, D., Jensen, E., Cook, A., Genen, L., Dysart, K., …Aghai, Z. (2019). Maternal breast milk feeding and length of treatment in infants with neonatal abstinence syndrome. *Journal of Perinatology, 39,* 876-882. DOI: 10.1038/s41372-019-0374-1					Level IV
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
"assess whether infants with neonatal abstinence syndrome (NAS), who receive maternal breast milk (BM), have shorter pharmacological treatment durations and lengths of stay compared with formula-fed infants."	Retrospective cohort study, non randomized	**Sampling Technique**: Convenience sample Late preterm and term infants (>/= 35 wks gestation at birth) born between 1/2010-11/2016 who received medical treatment for NAS were included. Only included infants in health plans managed by Optum Corporation	BM throughout hospitalization (exclusive BM or combination of formula and BM) versus those exclusively fed formula NAS defined as any infant exposed to opioids in uterus (both single drug and polysubstance use) who exhibited signs and symptoms of withdrawal	Primary: length of pharmacologic treatment for NAS Secondary: duration of hospitalization and rate of hospital readmission within 30 days	Sigma plot version 13 and SPSS Student's t-test, Mann-Whitney U-tests, Kruskal-Wallis one way analysis of variance, or X^2 tests If $p<0.05$, applied multivariable regression models Length of pharmacologic treatment for NAS in was significantly lower in infant who received any BM LOS was significantly lower in infants in the any BM group

		Excluded infants with severe congenital anomalies N=1738 430 received any BM, 70 infants received exclusive BM **Power Analysis:** No **Group Homogeneity:** significant differences in birth weight, race, and 5 min Apgar score. More mothers with commercial health insurance in any breastmilk group, and no breastmilk had non-narcotic substance use and tobacco exposure during pregnancy. Breastmilk group had higher GER treated with medications and gavage feedings.	Implementation of Baby Friendly Hospital (BFHI)Initiative in 2103, along with AAP affirmation for BM in babies with NAS.		No difference in hospitalization rates; No difference in hospitalization duration by yearly cohorts Increased rats of breastfeeding noted from 2010 to 2016 (23% to 29% ($p<0.001$); No difference in infants receiving exclusive BM. Duration of treatment decreased as percentage of infants receiving BM increased ($p=0.023$). Following BFHI, 2013-2016 cohort more likely to receive BM ($p<0.001$); no change in percentage of infants receiving exclusive BM No significant difference between duration of pharmacologic treatment and length of hospitalization pre BFHI and post. BM was predictive of any pharmacologic treatment ($p=0.019$) and length of hospitalization ($p=034$).

Grossman, M., Berkwitt, A., Osborn, R., Xy, Y., Esserman, D., Shapiro, E., & Bizzarro, M. (2017). An initiative to improve the quality of care of infants with neonatal abstinence syndrome. Pediatrics, 139 (6), DOI: 10.1542/peds.2016-3360.					Quality Improvement
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results

To change the paradigm of management of infants with NAS and to decrease ALOS by 50% for focusing intervention on nonpharmacologic care.	Quality improvement	Sampling Technique: Convenience sample March 2010 to June 2016 Applied interventions to infants ≥ 35 weeks gestation with methadone exposure Excluded infants with significant comorbidities, sepsis, need for surgery or respiratory support # Eligible: 421 # Accepted: 287 # Control:55 # Intervention: 188 during intervention, and 44 in postimplementation period Power analysis: not done Group Homogeneity:	**Control:** preintervention period January 2008 – February 2010, all infants at risk for NAS were admitted directly to NICU after birth and monitored for withdrawal using FNASS. Infants with either 3 FNASS scores ≥ 8 or 2 scores ≥ 12 in 24-hour were given morphine per protocol. **Intervention:** formed a multidisciplinary team to standardized nonpharmacologic care on inpatient unit, prenatal counseling of parents, simplify the assessment tool to eat, sleep, and console, decrease of morphine, and rooming in **Intervention fidelity (describe the protocol):**	**DV:** Primary outcome was ALOS Secondary measures included proportion of infants treated with morphine and the average total cost of hospitalization (direct and indirect) Process measurements included proportion of infants who were taking ≥ 50% of their feeds as breast milk and proportion of infants initially admitted to NICU for management of NAS Balancing measures included number of infants transferred to an ICU from inpatient unit, number of infants with seizures, and readmission within 30 days of discharge related to withdrawal **Measurement tool (reliability), time, procedure:**	**Statistical Procedures(s) and Results:** Statistical process control (SPC) charts to evaluate impact of intervention ALOS decreased from 22.4 days to 5.9 days ($p < 0.001$), Proportion of infants treated with morphine decreased from 98% to 14% ($p < 0.001$) Average cost of hospitalization decreased from $44,824 to $10,289 ($P < 0.001$) Proportion of infants that breastfed increased from 20% to 45% ($P = 0.01$) Proportion of infants admitted directly to NICU decreased from 100% to 20% ($P < 0.001$) No patient admitted to inpatient unit required transfer to ICU , none had seizre, and no readmissions within 30 days of discharge related to signs of withdrawal

Grossman, M., Lipshaw, M., Osborn, R., Berkitt, A. (2018). A novel approach to assessing infants with neonatal abstinence syndrome. Hospital Pediatrics. 8(1): 2154-1671.	Quality Improvement

Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
Assessed a novel approach to assessment for withdrawal symptoms in opioid exposed newborns through ESC	Retrospective chart review	Infants admitted from March 2014 to August 2015 with prenatal exposure to opioids ≥ 35 weeks gestation Compared treatment decisions of 50 consecutive opioid exposed infants with FNASS scores every 2-6 hours compared with ESC. All infants were managed with ESC method	Management for NAS initially occurred in nursery and then transferred to inpatient unit. Compared screening with ESC vs FNAS Medical records were reviewed for all with NAS codes	Proportion of pt started on morphine therapy by using the ESC approach compared with the predicted proportion of patients who would have been started on morphine if using FNASS Proportion of days that each approach recommended a specific pharmacologic management (no morphine, increased morphine, decreased morphine, or same dose of morphine) Assessed number of incidences ESC and FNAS differed in recommendation for morphine therapy Weight loss and adverse events (seizures, transfers to ICU, 30 d hospital readmissions)	ESC approach resulted in morphine initiation for 12% vs 62% (predicted) with FNAS (p<.001) Morphine initiated or increased on 8 patient days using ESC 2.7% vs 25.7% with FNASS (p<.001) 60% in which approaches disagreed such that ESC approach ed to no change or decrease in morphine dose where FNASS approach would have increased therapy. On disagreement days, FNASS day scores averaged and was lower. No adverse events reported Average maximum weight loss for infants was 8.7% with average weight loss 7.2%

Howard, MB., Schiff, DM, Penwill, N., Si, W., Rai, J., Wolfgang, T., Moses, JM., Wachman, EM. (2017). Impact of parental presence at infants' bedside on neonatal abstinence syndrome. *Hospital Pediatrics, 7 (2),* 63-69. DOI:10.1542/hpeds.2016-0147					IV
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results

"examine the association between rates of parental presence and NAS outcomes"	Retrospective single center cohort study, chart review of infants born between 3/2015 and 4/2016 with in utero opioid exposure 2 investigators extracted data from EHR	**Sampling Technique**: = 86 mother infant pairs **Power Analysis:** No Eligibility criteria: maternal opioid agonist treatment with methadone or buprenorphine during third trimester of pregnancy and infants >/= 36 weeks treated with opioid replacement therapy for opioid withdrawal on pediatric inpatient unit. Exclusion: infants transferred from BMC to another hospital before being medically ready for discharge or NICU admission > 48 hours or prolonged stay for reasons other than NAS; also excluded infants that did not require pharmacologic treatment of NAS **Group Homogeneity:**	Parental presence at bedside	Mean NAS score Length of Stay Total opioid days Total opioid dose (morphine equivalents)	Any amount of breastfeeding was associated with decreased LOS ($p<0.01$) Breastfeeding was associated with decreased duration of opioid therapy and decreased total morphine equivalent dose Mean NAS score was lower for infants who were breastfed ($p<0.01$) Parental presence was higher for infants where were breastfed ($P<0.0001$) Bivariate analysis 100% parental presence was associated with 1 point decrease in mean NAS score ($P<0.01$), a 9 day decrease in LOS ($P<0.01$), and 8 fewer days of opioid therapy ($P<0.001$) Decrease in total morphine equivalents dose with increased parental presence (not significant) Mean NAS score was significantly lower when parent was present ($P<0.0001$) Multiple linear regression adjusting for breastfeeding, parental presence significantly associated with lower mean NAS score ($P=0.02$), fewer days of opioid therapy ($P=0.03$), shorter LOS ($P=0.09$)

MacMillan,K., Rendon, C., Verma, K., Riblet, N., Washer, D., & Volpe-Holmes, A. (2018). Association of rooming-in with outcomes for neonatal abstinence syndrome: A systematic review and metanalysis. *JAMA Pediatrics, 172(4),* 345-351. DOI 10.1001/jamapediatrics.2017.5195					Level I
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
"Evaluate the benefits and harms of rooming-in compared with standard NICU care for management of NAS."	Systematic review and meta-analysis Titles and abstracts were screened 2 reviewers for inclusion	**Sampling Technique**: Literature search MEDLINE (1946-6/25/2017) CINAHL (1981-2016) Cochrane library Clinicaltrials.gov Included RCTs, cohort studies, quasi-experimental, before after QI **Power Analysis:** No polysubstance users included 6 studies, N=549 patients **Group Homogeneity:** studies were not homogenous	Control: standard NICU care with NAS assessment tool Intervention: rooming in, defined as infant and mothers remaining together 24 hrs per day except for other medical interventions, also included other cointerventions such as skin to skin, swaddling, soothing, and breastfeeding	Primary: proportion of infants requiring pharmacologic treatment Secondary: cumulative dose of opioid medication, duration of opioid treatment, LOS, total cost of hospitalization, family satisfaction, breastfeeding incidence, proportion of infants discharged home in familial custody Examined adverse events reports and readmission rates to evaluate potential harms of rooming in	Level of Measurement: Relative risk (RR) and 95% CI for dichotomous outcomes and weighted mean differences (WMD) and 95% CI for continuous outcomes Qualitative summary for outcomes not amenable to quantitative analysis Study results for all outcomes pooled Assessed groupings for heterogeneity using I^2 statistic; I^2<50%; performed sensitivity analyses to reanalyze outcomes Performed sensitivity analyses - Risk of Bias in Non-Randomized Studies of Interventions (ROBINS-I) tool, Rooming in associated with lower proportion of infants requiring pharmacotherapy compared with standard NICU care (RR, 0.37; 95% CI, 0.19-0.71) (I^2-85%); adjusted for heterogeneity (RR, 0.32; 95% CI, 0.18-0.57) (I^2-13%)

					LOS significantly shorter with rooming in vs standard NICU care (WMD, -10.41 days; 95% CI, -16.84 to -3.98 days) (I^2-91%); adjusted for heterogeneity (WMD, -12.84 days; 95% CI, -20.20 to -5.67 days) (I^2-58%) Rooming in is associated with lower costs, (I^2-97%) prevented formal meta-analysis Qualitative analysis No adverse outcomes reported with rooming in, no increase in readmission rate 2 studies reported increase in breastfeeding with rooming in while 2 studies reported no difference Four studies reported on discharge home with families, one showed higher proportion of rooming in infants remaining in family custody, 3 studies reported high rates of discharge with family with no significant difference Three studies reported decrease number of days receiving pharmacotherapy with rooming in

McKnight, S., Coo, H., Davies, G., Holmes, B., Newman, A., Newton, L., Dow, K. (2016). Rooming in for infants at risk of neonatal abstinence syndrome. *Am J Perinatology, 33*, 495-501. DOI: 10.1055/s-0035-1566295	Level (Melnyk) Quality Improvement

Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
"To examine the impact of a rooming-in program for infants at risk of neonatal abstinence syndrome (NAS) on the need for pharmacologic treatment and length of hospitalization."	Retrospective cohort study Kingston General hospital introduced rooming-in model of care for at-risk infants in 2013. Prior to the practice change, at-risk infants were admitted to the NICU for observation.	Sampling Technique: Convenience sample of infants born between 5/1/2012 and 9/30/14 with a gestational age of at least 36 weeks considered to be at risk of NAS. All were singletons. Excluded infants who would have been excluded in rooming-in group because of apprehension by CPS, planned adoption, or NICU admission for other medical reasons. # Eligible: 55 # Accepted: 44 # Control: 24 # Intervention: 20 Power analysis: not done Group Homogeneity: no significant differences found for any of the characteristics examined	**Control:** First group were infants born between 5/1/2012 and May 31, 2013 were NICU group – if at risk were admitted to NICU for observation and treatment if needed. **Intervention:** Second group was comprised of infants born between 9/1/2013 and 9/30/2014, were the rooming-in group. Mothers and their infants were admitted to private rooms in pediatric unit and monitored for NAS. If mFNASS > 8 x3 or 12 x2, morphine is initated and infant is transferred to NICU. Once stable dose is achieved, infants are returned to rooming-in model as morphine is weaned. Infants born between June through August 2013 were excluded as this was a transition phase in the implantation group. **Intervention fidelity**	DV: primary outcome - need for pharmacologic treatment and length of hospitalization Secondary outcome - duration of treatment with morphine, maximum daily dose administered, need for adjunct medication. Measurement tool (reliability), time, procedure:	Statistical Procedures(s) and Results: SPSS version 22. Primary and secondary outcomes, as well as maternal and infant characteristics, were compared between NICU and rooming in groups using independent sample t test or Mann-Whitney U test for continuous variables and chi square test for Fisher exact test for proportions. Mann-Whitney U test was used to examine whether length of hospitalization differed between groups who were and were not treated with morphine. Assessed if breastfeeding was a mediator to primary outcomes for entire cohort $P<0.05$ Lower proportion of infants in the rooming-in group required pharmacologic treatment and also had a significantly shorter LOS ($p<0.001$) No significant differences in days treated with morphine ($p = 0.83$), maximum daily dose of morphine ($p = 0.9$), and

			Electronic medical records were reviewed to abstract data on primary and secondary outcomes, maternal and infant characteristics, and other factors that may have impact on outcomes of interest (birth weight, tobacco use in pregnancy, types of drugs self-reported, infant feeding method, whether infant had other medical issues) All infants were assessed for signs of NAS with modified Finnegan scoring tool.		need for adjunct medication (p = 0.54) although 30% of infants treated with morphine in NICU group required adjunct medication; none of the 3 infants on morphine in the rooming-in group required adjunct therapy Higher proportion of infants in rooming-in group were breastfed exclusively or in combination with formula, although N.S. Infant feeding method was not significantly associated with need for pharmacologic treatment (p = 0.72), or length of hospitalization (p = 0.76) When cohort was stratified by feeding method, rooming in and feeding methods remained significant, except for LOS in formula fed (p = 0.12) Strong association between need for pharmacologic treatment and LOS (p < 0.001)

McQueen, K., Taylor, C., Murphy-Oikonen,J. (2019). Systematic review of newborn feeding method and outcomes related to neonatal abstinence syndrome. JOGNN, 48 (4): 398-407.					V
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results

Appraise and synthesize existing studies on relationship between newborn feeding method and neonatal outcomes r/t NAS	Systematic review Systematic search of lit using PubMed, CINAHL, Nursing and Allied Health, PsychINFO, Evidence Baed Medicine, Web of Science, and MEDLINE Eligible for inclusion if original data or outcomes r/t newborn feeding were reported, followed quantitative design comparing breast and formula feed, and English from 1990 to 2018	8 studies met inclusion All were newborns exposed to opioids in utero – methadone, Buprenorphine Treatment medications varied – morphine, phenobarbital, morphine or phenobarbital, methadone or phenobarbital, diluted tincture of opium or morphine	Newborn feeding method – breastfeeding, expressed breastmilk, and formula feeding Exclusive breastfeeding, mixed feeding, formula feeding Calculated breastfeeding as % of breastmilk feeds, number of formula feeds, self-identified breastfeeding, any breastfeeding at birth and at 6 to 8 weeks after birth	Outcomes related to NAS Need for pharmacologic treatment	6 studies demonstrated that breastfed newborns were less likely to require pharmacologic treatment than formula fed newborns Newborns who predominately breastfeed on 5th day of life were significantly less likely to require pharmacologic treatment than formula fed newborns Breastfed newborns required less pharmacologic treatment, but differences were not statistically significant No difference in need for pharmacotherapy for mothers on methadone or buprenorphine between breastfed or formula fed SENs, however analysis of methadone subgroup showed BF associated with decreased need for pharmacologic therapy (53% vs 80%, $p<0.05$), no sig diff with buprenorphine group Decreased duration of pharmacologic treatment with breastfeeding Breastfeeding associated with significantly reduced length of stay Mean FNAS scores were lower in breastfeed newborns BF newborns less likely to score above threshold for treatment

					Longer time to onset of symptoms among BF newborns

Sing, R., Rothstein, R., Ricci, K., Visintainer, P., Shenberger,J., Attwood, E., Friedmann, P. (2020). Partnering with parents to improve outcomes for substance exposed newborns – a pilot program. Journal of Perinatology. 40: 1041-1049.					Quality Improvement
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
Assess impact of parental involvement in care for term substance exposed newborns (SENs) through rooming in (RI) and parent presence	Prospective observational cohort study of mothers diagnosed with OUD Tertiary carecenter with 110 beds and 57 bassinettes Level III NICU – 55 bed	Women with diagnosis of OUD offered opportunity to participate and those eligible signed commitment to RI 431 SEN, 194 preintervention and 237 postintervention	EMPOWER program - Developed personalized pregnancy care plans with well-defined goals for pregnancy and delivery in to increase likelihood of adherence to medication for OUD, eligibility for RI, breastfeeding and custody, and decreased need for NOWS related pharmacotherapy In 2017, RI was available to all eligible families – provided quiet non stimulating environment for mother to provide 24/7 care. Utilized FNAS. Training for PP nursing staff and validated on use	Need for NOWS related pharmacotherapy NICU and hospital stay Duration of pharmacotherapy Breastfeeding initiation and status at discharge Parental retention of custody at discharge Hospital costs	Decreased need for meds 81.1% in preimplementation vs 38.8% postintervention (p<.001) Hospital stay decreased 20 vs 13 days (p<.001) NICU admission decreased from 100% to 60% (p<.001) Duration of med therapy decreased 17 vs 10 days (p<.001) No significant difference in BF eligibility 97.3% to 93.3%, p=.44), greater percentage in postI initiated BF (92.3% vs 57.7%. p=.01), and continued at discharge (92.3% vs 39%, p<0.001). All babies discharged home to parent in post I cohort Daily savings of $2235 per newborn in hospital charges (does not account for other charges), equates to savings of ~ $45450 per SEN

Volpe Holmes, A., Atwood E., Whalen, B., Beliveau J., Dean Jarvis, J. Matulis, J, Ralston, S. (2016). Rooming-in to treat neonatal abstinence syndrome: Improved family centered care at lower cost. Pediatrics. 137(6). DOI 10.1542/peds.2015-2929.					Quality Improvement
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
Decrease the proportion of opioid-exposed infants treated with medications and to decrease LOS and costs	Quality improvement PDSA cycles Improve the care of opioid-exposed newborns by involving families, standardizing assessments and treatment, and transitioning to rooming in for the full hospital stay Preimplementation – obs for minimum of 96 hours after exposure to long acting opioids Newborns roomed in on MIU If need for increased observation or pharmacologic tx with morphine transferred to NICU Once stabilized, could be transferred to inpatient peds for families to room in	63 bed/16 bassinette children's hospital 207 newborns – 163 met inclusion Excluded infants who were not "otherwise well newborns" because GA < 35 weeks or another reason for NICU admission or who completed treatment at another facility. Rural academic tertiary care center Included all births between 3/12 and 2/15 with reported or laboratory confirmed maternal opioid use	Standardization of mFNAS scoring Changed timing of NAS scoring to every 2-4 hours after each feed, during skin to skin holding, while infant is awake "infant centered scoring" Prenatal preparation sessions at local perinatal substance abuse treatment centers and updated education materials on NAS for OB clinic Parent symptom recording incorporated into process Modified FNAS interpretation to not use scores alone as driver for pharmacologic therapy – prioritized symptoms and delayed pharmacotherapy in first 24 -36 hours when exposure to long acting opioids together with	Concordance of FNAS scores (k correlations) Average daily score Percent treated with oral morphine Percent treated with adjunctive medication Cumulative morphine dose LOS Costs for all opioid exposed infants and for those threated pharmacologically Balancing measures included adverse events (death or unplanned ICU transfer), 30 day readmission, discharge in parental care and follow up for PCP of 2014 newborns with higher NAS scores to examine unintended consequences	Concordance within 1 point for FNAS scores was > 90% for all units from 9/13-12/13 Mean daily score did not change over time Proportion of newborns requiring treatment declined from 46 to 27% as did precent of newborns requiring adjunctive treatments Cumulative morphine exposure per treated infant decreased from 13.7 to 6.6 mg Ave LOS for pharmacologic treated NAS decreased from 16.9 to 12.3 days. LOS for newborns not requiring pharmacologic treatment remained stable (4.2-4.4d, p=0.33) Mean hospital costs for newborn requiring pharmacologic treatment declined from $19737 to $8755 and cost for all opioid exposed newborns also decreased from $1100 during the study's baseline year to $5300 during the second intervention year (p<0.01)

			SSRIs or tobacco may co occur Moved to full rooming in on MIU and pediatric unit Volunteers to provide bedside support when family unavailable Changed morphine administration from 3-4 hours to align with half life and newborn sleep/feed cycles		There were no adverse events and thirty day all cause readmission remained stable Two newborns were readmitted during the baseline year, with 3 and 4 newborns readmitted during the first and second year of intervention (4%, 5%, and 7% respectively, p=.46) No newborns were readmitted for NAS treatment, 1 in baseline and 1 on second intervention year was admitted for FTT One infant suffered skull fracture for fall Other admission unrelated to NAS Number of newborns discharged in parental custody remained stable (93% in baseline and 90% in second intervention year, p=.73) Follow up with PCPs of newborns with higher NAS scores showed no growth or feeding concerns at 1-4 months.

Wachman, E, Grossman, M, Schiff D, Philipp, B., Minear, S. et al. (2018). Quality improvement initiative to improve inpatient outcomes for neonatal abstinence syndrome. Journal of Perinatology. 38: 1114-1122.					Quality Improvement
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results

Improve NAS outcome (reduction in LOS and pharmacologic treatment) through non pharmacologic interventions	QI design PDSA cycles with implementation to nonpharmacologic care bundle, prioritization of symptom and functional based assessment, and transition to methadone as primary pharmacologic treatment	275 opioid exposed infants – 240 met inclusion Opioid exposed newborns > 36 weeks gestation with in utero opioid exposure April 2015-April 2016 baseline and January-December 2017 post intervention	PDSA cycle to implement a nonpharmacologic care bundle (parental presence, skin to skin contact, holding, breastfeeding, and creating a calm, low stimulation environment) with NAS assessment completed skin to skin and in mother's room Staff completed training both online and in person Prenatal/parental messaging – provided mothers with education as primary NAS treatment for infants and important in role of NAS care. Methadone treatment could be provided at clinic near hospital to allow mothers to stay overnight. Support individual identified if parent could not be involved Team huddle if FNAS score elevated with prioritization of symptoms	LOS due to NAS, pharmacologic treatment, treatment with adjunctive pharmacologic agent, opioid treatment days, breastfeeding initiation, hospital charges Process measure of parental presence at bedside to examine adherence to non pharmacologic care Hospital readmission rate within 30 days related to NAS, NICU admissions secondary to NAS complications, and seizures pre/post intervention	Mean LOS decreased from 17.4 to 11.3 ($p<0.0001$) Total hospital LOS decreased from 17.5 to 11.6 (Opioid treatment days for pharmacologically treated infants decreased from 16.2 to 12.7 ($p<0.0001$) Pharmacologic treated infants decreased from 87.1 to 40% ($p<0.0001$) Breastfeeding initiation rates did not differ Ave hospital charges decreased from $31825 to $20668 per infant during the intervention period ($p<0.001$) Parental presence at the bedside increased from mean of 55.6 to 75.8% ($p<.001$). Mean cuddler presence was 4.4% in postintervention group increasing total caregiver presence to 80% No 30 day re admissions for NAS in preintervention and during intervention period. Due to infant needing readmission for methadone treatment, protocol was changed to include longer in patient observation after discontinuation

			Held off medication >24 hour if though due to co exposure and transitioned to methadone Implementation of ESC assessment Utilization of cuddlers		No NICU admissions for mgt of NAS or complications and no seizures reported during the study period

Table 2 Evidence Synthesis

Evidence Based Practice Question (PICO): Does implementation of Eat, Sleep, Console model of care for opioid exposed newborns results in decreased opioid administration and decreased length of stay?			
Level of Evidence	**# of Studies**	**Summary of Findings**	**Overall Quality**
I	**1**	MacMillan et al. (2018) completed a systematic review and meta-analysis including RCTs, cohort studies, quasi-experimental, and before and after quality improvement for outcomes in newborns with NAS. Rooming in is associated with decreased use of pharmacotherapy and patient costs.	Heterogeneity across studies, however qualitative and quantitative analysis support rooming in as improving outcomes.
IV	**5**	Achilles et al (2019) implemented ESC assessment tool, increased family education and engagement, and change from methadone weaning to nonpharmacologic and morphine as needed approach to care of opioid exposed infants. Postintervention infants required lower requirement for medication, shorter length of stay, and lower direct costs of care.	B. This was a pre and post intervention study with group homogeneity and utilization of standardized assessment tool. They were unable to separate effects of breastfeeding from rooming in, but even in non-breastfeeding mothers rooming in was associated with improved outcomes. Although non random assignment, participants did not choose study groups. Did not assess for interrater reliability in FNASS scores.

		Blount et al (2019) transitioned from FNASS to ESC tool, increased education re nonpharmacologic interventions, and morphine PRN to opioid exposed infants. Average length of stay for opioid exposed infants decreased as well as decreased morphine administration.	B. This was a single center pre and post intervention. Homogeneity was maintained. Staff trained in NAS assessment to improve interrater reliability. No quantification of family involvement, and setting may not be generalizable to other locales. Difficult to say which intervention had the most significant impact (ie ESC versus PRN morphine).
		Favara et al (2019) assessed whether infants with NAS who received breastmilk had shorter pharmacologic treatment duration and length of stay. They carried out a retrospective chart review from 2010 to 2016. Infant who received any breastmilk had significantly lower length of pharmacologic treatment and had lower lengths of hospitalization. Breastfeeding infants with NAS is associated with decrease duration of treatment and length of hospital stay while promoting maternal infant bond, as well as ease of newborn transition.	B. Single center pre and post intervention. Small sample size. Unable to identify if ESC or PRN morphine was driver to change. Homogeneity was largely met, only increased maternal tobacco use in intervention group. No mention on training for ESC use to improve interrater reliability.
		Grossman et al (2018) analyzed treatment decisions for pharmacologic treatment for NAS in opioid exposed newborns using the traditional FNASS versus ESC assessment for treatment decisions. Infants managed with ESC approach were treated with morphine significantly less than with the FNASS.	
		Howard et al (2017) investigated association of parental presence and NAS outcomes on opioids exposed newborns. A retrospective cohort study of parental presence in NAS newborns was conducted to identify NAS symptoms, and length of stay. Parental presence at	

		the bedside was associated with a shorter length of stay , fewer days of infant opioid therapy, and lower FNASS.	B. This single center pre and post implementation study simplified the FNASS to allow providers to assess clinically relevant factors. Homogeneity between groups met, interventions standardized to ensure similar treatments delivered. Also, staff were trained on interventions. B. RCT on methadone vs morphine for NAS treatment ongoing simultaneously, which may have confounded results. Also, trial participants more likely to have higher amounts of parental presence. This was factored in as modifier to analysis. Because it is was a chart review, data re parental presence was not always documented and does not allow for assessment of the amount of time or level of involvement. Did nt include infants that did not receive pharmacologic treatment. Not generalizable to all sites.
V	**1**	MacVicar (2019) completed a systematic mixed study review of initiatives to explore nonpharmacologic management of infants at risk of NAS. Rooming in and consolation therapy were associated with decreased pharmacotherapy and shorter hospital stays for newborns. Also identified poor interrater reliability and unreliable assessment tools for assessment and management.	B/C. Mixed results regarding effectiveness of various interventions. Heterogeneity of studies does not allow for meta-analysis of findings. Did not take into account one type of substance, included various gestational ages, and exposure.

Figure 1.

Nursey NAS Treatment Management Policy

Nursery – Neonatal Abstinence (Withdrawal) Syndrome (NAS) Treatment Management

Primary Approach: Eat, Sleep, Console - Treatment for a substance exposed newborn in which a parent/caregiver, and/or staff provides ad lib feeds based upon infant cues and holding/comfort measures such as:

- Swaddling
- Pacifier for nonnutritive, sucking with Parental Permission
- On demand feeds with infant feeding cues.
- Dark, quite room.
- Gentle rocking
- Swing or bouncy seat
- Skin to skin
- Soft music
- Cuddler staff

Eat, Sleep, Console Scoring:

1. **Complete** ESC score every 2-4 hours with feeds and only when infant is awake.
   - Term infants with no feeding issues who feed every 4 hours may be scored every 4 hours
   - Preterm infants or those infants requiring every 3-hour feeds should be scored every 3 hours
2. If "No" to any question, reinforce non-pharmacologic interventions and reassess within 2 hours.
3. If "YES" to all three questions, continue to monitor every 2-4 hours with ESC until order is discontinued.
3. If two consecutive ESC scores of "NO", notify provider for bedside evaluation.
4. If "YES" to all ESC questions for 3-5 days, provider may discharge infant.

Secondary Approach: Pharmacologic Treatment – If the infant is unable to feed, sleep, or be consoled with nonpharmacologic interventions then the infant will be evaluated by provider to determine need for medical management.

Medical Treatment Management:

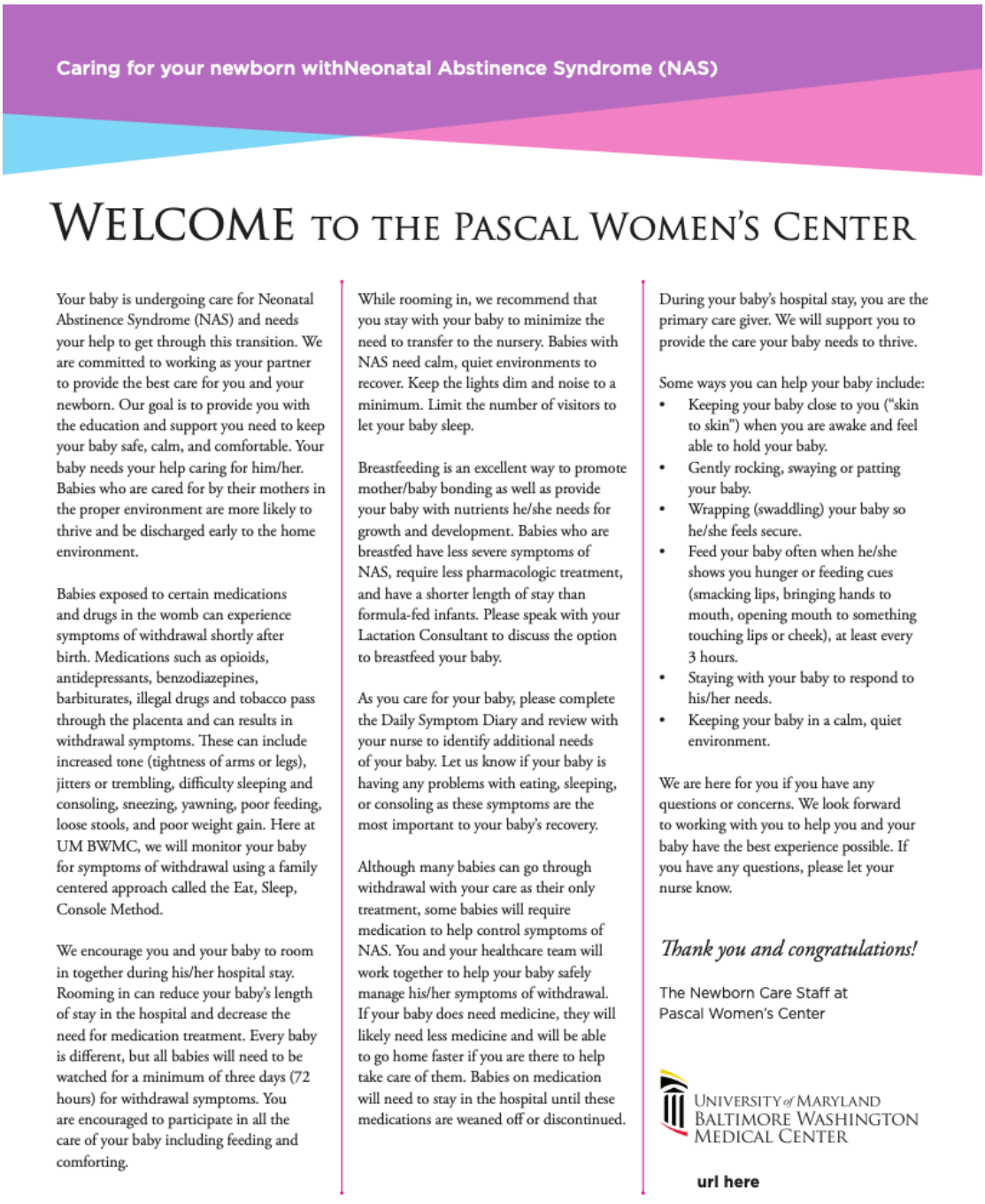
1. If symptoms not controlled by non-pharmacologic interventions, consider formula/breastmilk fortification (to 22 kcal/oz or 24 kcal/oz)
2. If morphine not previously administered, anticipate that provider may order trial morphine 0.03 mg/kg PRN Q3 hours x 1 dose or Q4 PRN. If infant requires more than 2 PRN doses in a 24-hour period anticipate provider order for morphine 0.03 mg/kg PO Q3 hours.
3. Monitor cardiorespiratory (CR) status with continuous pulse oximetry as ordered when initiating medication. Continue to monitor CR and vital signs for minimum of 24 hours following each PRN dose.
4. If infant requires scheduled dose(s) of morphine CR monitor order with continuous pulse oximetry will continue until 24 hours of last escalation of morphine dose or per provider order.
5. Assess newborn for signs of over sedation or excessive sleepiness.
6. Observe for abdominal distention and decrease or absence of bowel sounds.
7. Maintain strict intake and output and monitor for urine retention if output is decreased.
8. Maintain ad lib cue-based feeding schedule when infant is receiving medical management. Full term infants (≥38 weeks) will have feeding spaced no further than 4 hours and infants < 38 weeks will have feed no further than 3 hours apart.
9. Obtain order for petroleum ointment to decrease risk of diaper excoriation. Apply as needed.
10. Hold morphine sulfate oral solution dosing for respiratory rate less than 30 or any apneic episodes and notify provider.
11. Anticipate order for Naloxone per provider orders as a reversal agent for adverse effects of morphine sulfate.
12. If two consecutive ESC documentation of "NO" on scheduled morphine doses, the provider may increase dose by 10% (unlike starting dose which is weight based) and/or add clonidine adjunct per protocol.
13. Wean the infant from the medication after 24 hours of continued "YES" to all three ESC questions
14. Wean morphine dose by 10% every 24 hours.
15. Once dose reaches 0.04mg, morphine can be spaced to every 6 to 8 hours then every 12 to 24 hours prior to discontinuation.
16. After weaning medication off, continue to observe ESC score for minimum of 24 hours prior to discharge.

Transfer Criteria:

1. **Consider** a transfer to a neonatal intensive care unit (NICU) if:
   - ESC score of "NO" AND diluted morphine dose greater than 0.1 mg/kg/dose
   - Diluted morphine sulfate dose greater than 0.10 mg/kg/dose

Figure 2.

Parent Welcome Letter



Caring for your newborn withNeonatal Abstinence Syndrome (NAS)

WELCOME TO THE PASCAL WOMEN'S CENTER

Your baby is undergoing care for Neonatal Abstinence Syndrome (NAS) and needs your help to get through this transition. We are committed to working as your partner to provide the best care for you and your newborn. Our goal is to provide you with the education and support you need to keep your baby safe, calm, and comfortable. Your baby needs your help caring for him/her. Babies who are cared for by their mothers in the proper environment are more likely to thrive and be discharged early to the home environment.

Babies exposed to certain medications and drugs in the womb can experience symptoms of withdrawal shortly after birth. Medications such as opioids, antidepressants, benzodiazepines, barbiturates, illegal drugs and tobacco pass through the placenta and can results in withdrawal symptoms. These can include increased tone (tightness of arms or legs), jitters or trembling, difficulty sleeping and consoling, sneezing, yawning, poor feeding, loose stools, and poor weight gain. Here at UM BWMC, we will monitor your baby for symptoms of withdrawal using a family centered approach called the Eat, Sleep, Console Method.

We encourage you and your baby to room in together during his/her hospital stay. Rooming in can reduce your baby's length of stay in the hospital and decrease the need for medication treatment. Every baby is different, but all babies will need to be watched for a minimum of three days (72 hours) for withdrawal symptoms. You are encouraged to participate in all the care of your baby including feeding and comforting.

While rooming in, we recommend that you stay with your baby to minimize the need to transfer to the nursery. Babies with NAS need calm, quiet environments to recover. Keep the lights dim and noise to a minimum. Limit the number of visitors to let your baby sleep.

Breastfeeding is an excellent way to promote mother/baby bonding as well as provide your baby with nutrients he/she needs for growth and development. Babies who are breastfed have less severe symptoms of NAS, require less pharmacologic treatment, and have a shorter length of stay than formula-fed infants. Please speak with your Lactation Consultant to discuss the option to breastfeed your baby.

As you care for your baby, please complete the Daily Symptom Diary and review with your nurse to identify additional needs of your baby. Let us know if your baby is having any problems with eating, sleeping, or consoling as these symptoms are the most important to your baby's recovery.

Although many babies can go through withdrawal with your care as their only treatment, some babies will require medication to help control symptoms of NAS. You and your healthcare team will work together to help your baby safely manage his/her symptoms of withdrawal. If your baby does need medicine, they will likely need less medicine and will be able to go home faster if you are there to help take care of them. Babies on medication will need to stay in the hospital until these medications are weaned off or discontinued.

During your baby's hospital stay, you are the primary care giver. We will support you to provide the care your baby needs to thrive.

Some ways you can help your baby include:

- Keeping your baby close to you ("skin to skin") when you are awake and feel able to hold your baby.
- Gently rocking, swaying or patting your baby.
- Wrapping (swaddling) your baby so he/she feels secure.
- Feed your baby often when he/she shows you hunger or feeding cues (smacking lips, bringing hands to mouth, opening mouth to something touching lips or cheek), at least every 3 hours.
- Staying with your baby to respond to his/her needs.
- Keeping your baby in a calm, quiet environment.

We are here for you if you have any questions or concerns. We look forward to working with you to help you and your baby have the best experience possible. If you have any questions, please let your nurse know.

Thank you and congratulations!

The Newborn Care Staff at
Pascal Women's Center

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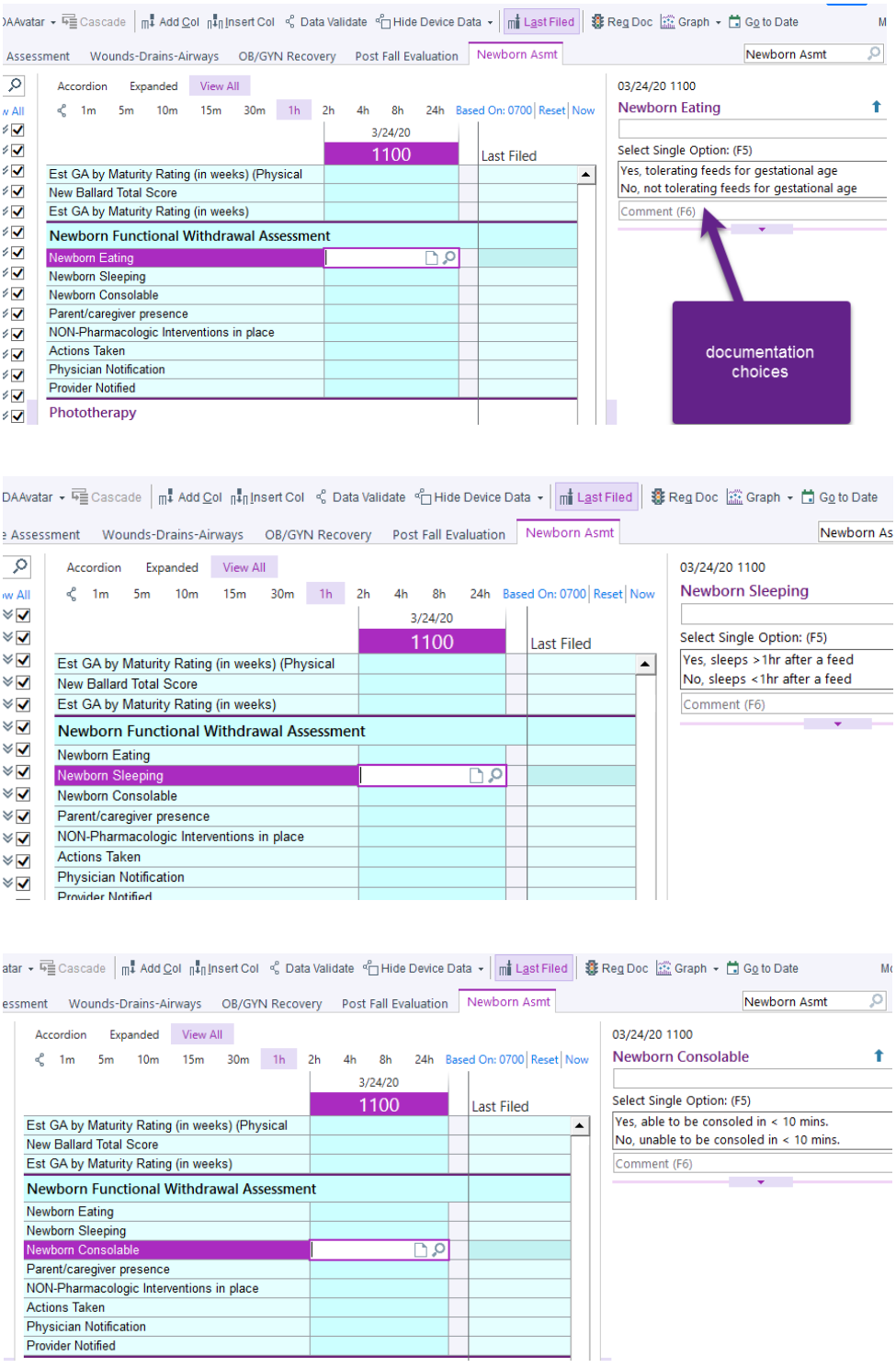
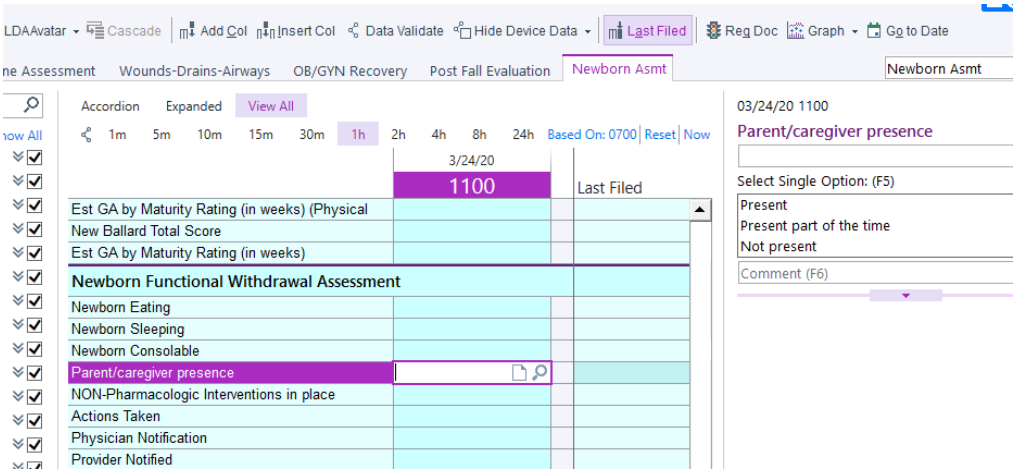
BALTIMORE WASHINGTON
MEDICAL CENTER

url here

Figure 3.

EHR Newborn Functional Assessment Tool

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Newborn Sleeping
Newborn Consolable
Parent/caregiver presence
NON-Pharmacologic Interventions in place
Actions Taken
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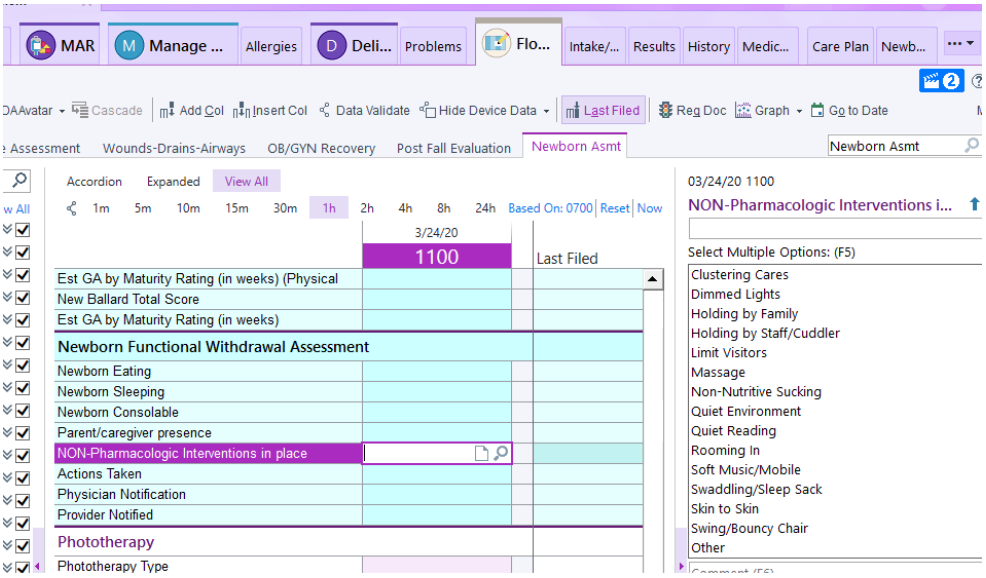
Present part of the time
Not present
Comment (F6)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Est GA by Maturity Rating (in weeks)
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Newborn Eating
Newborn Sleeping
Newborn Consolable
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Actions Taken
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Provider Notified
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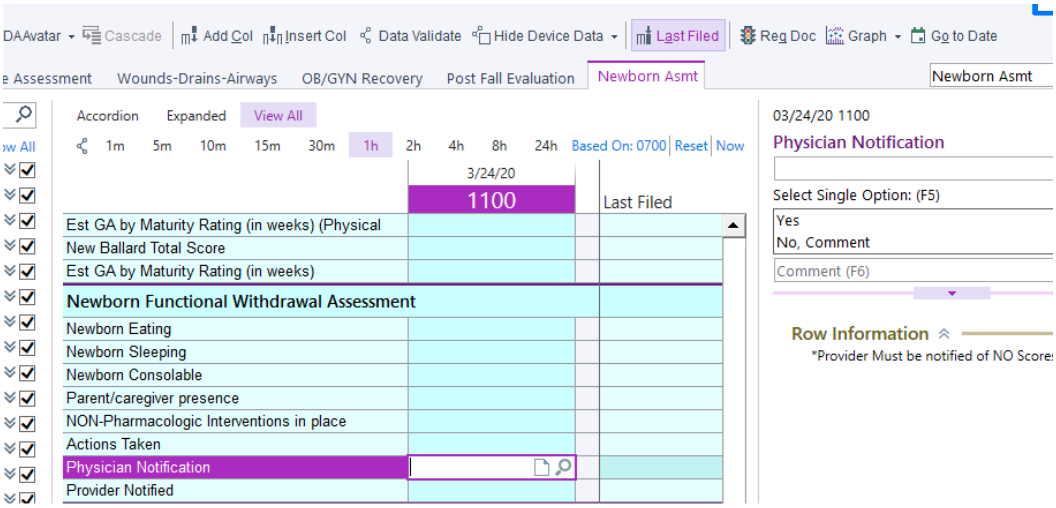
Dimmed Lights
Holding by Family
Holding by Staff/Cuddler
Limit Visitors
Massage
Non-Nutritive Sucking
Quiet Environment
Quiet Reading
Rooming In
Soft Music/Mobile
Swaddling/Sleep Sack
Skin to Skin
Swing/Bouncy Chair
Other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New Ballard Total Score
Est GA by Maturity Rating (in weeks)
Newborn Functional Withdrawal Assessment
Newborn Eating
Newborn Sleeping
Newborn Consolable
Parent/caregiver presence
NON-Pharmacologic Interventions in place
Actions Taken
Physician Notification
Provider Notified
03/24/20 1100
Physician Notification
Select Single Option: (F5)
Yes
No, Comment
Comment (F6)
Row Information
*Provider Must be notified of NO Score

Figure 4.

EHR Order Set for Providers

General

ADT - Transfer Patient (Single Response) [360097]

- ● Transfer Patient [ADT00140]
  - Update Admitting Team/Service To:
  - Is updated team Primary?
  - Remove all existing teams?
  - Facility:
  - Level of Care:
  - Comments:
  - Update Attending Provider To:
  - Admitting Team/Service:

Vital Signs [318762]

- ☑ Vital Signs [NUR00490]
  - Routine, 3 times daily, Starting today with First Occurrence Include Now, On admission, 3 times daily with cares.
- ☐ Pulse Oximetry, [NUR00357]
  - Routine, Continuous
  - Pulse Ox with Vitals:
  - Overnight?
  - Parameter Keep O2 Sat >=:
  - Parameter HR Alarm High:
  - Parameter HR Alarm Low:
  - Target Range: If on 02 for < 33 weeks (88-93%) for > or = to 33 weeks (90-97%)
- ☐ Blood Pressure x 4 Extremities [NUR00116]
  - Routine, once
- ☐ Cardiac Monitoring, Continuous [NUR00002]
  - Routine, continuous until discontinued, Starting today
  - Patient may travel off unit without cardiac monitor:
  - Indication for Telemetry (Time to Alert):
  - Monitoring Type:

Intervention [360096]

- ☑ Newborn Functional Assessment [NUR00643]
  - Routine, See Comments, Starting today, On admission & every 3-4 hours following feedings.
- ☐ Newborn Peripheral IV Insert & Maintain Panel [400011]
  - ☐ Peripheral IV-Insert/Maintain [IVT00003]
    - Routine, once
    - Reason:
    - **"And" Linked Panel**
  - ☐ 0 to 28 days [363568]
    - ☐ normal saline flush 0.9 % for sterile field [98351]
      - 1 mL every 3 hours, Intravenous, every 3 hours
    - ☐ normal saline flush 0.9 % for sterile field [98351]
      - continuous PRN, Intravenous, continuous PRN, Line Care
      - Scan each flush being used.

Ancillary Consults [98849]

- ☑ Consult to Care Management [CON00066]
  - Routine, once
  - Reason:
  - SCN Admission

Medications

Morphine Sulfate (Single Response) [360098]

- ● morphine 0.16mg/0.4ml oral solution [415853]
  - 0.04 mg/kg every 3 hours PRN, Oral, every 3 hours PRN, for Neonatal Abstinence Syndrome
  - Notify provider prior to each administration. Give with feedings. Hold if respiratory rate <30 or apnea.

Zinc oxide [343396]

- ☐ zinc oxide 20 % ointment [8874]
  - 1 Application, Topical, continuous PRN, Skin Irritation, for Exoriation

Figure 5.

HER Patient education

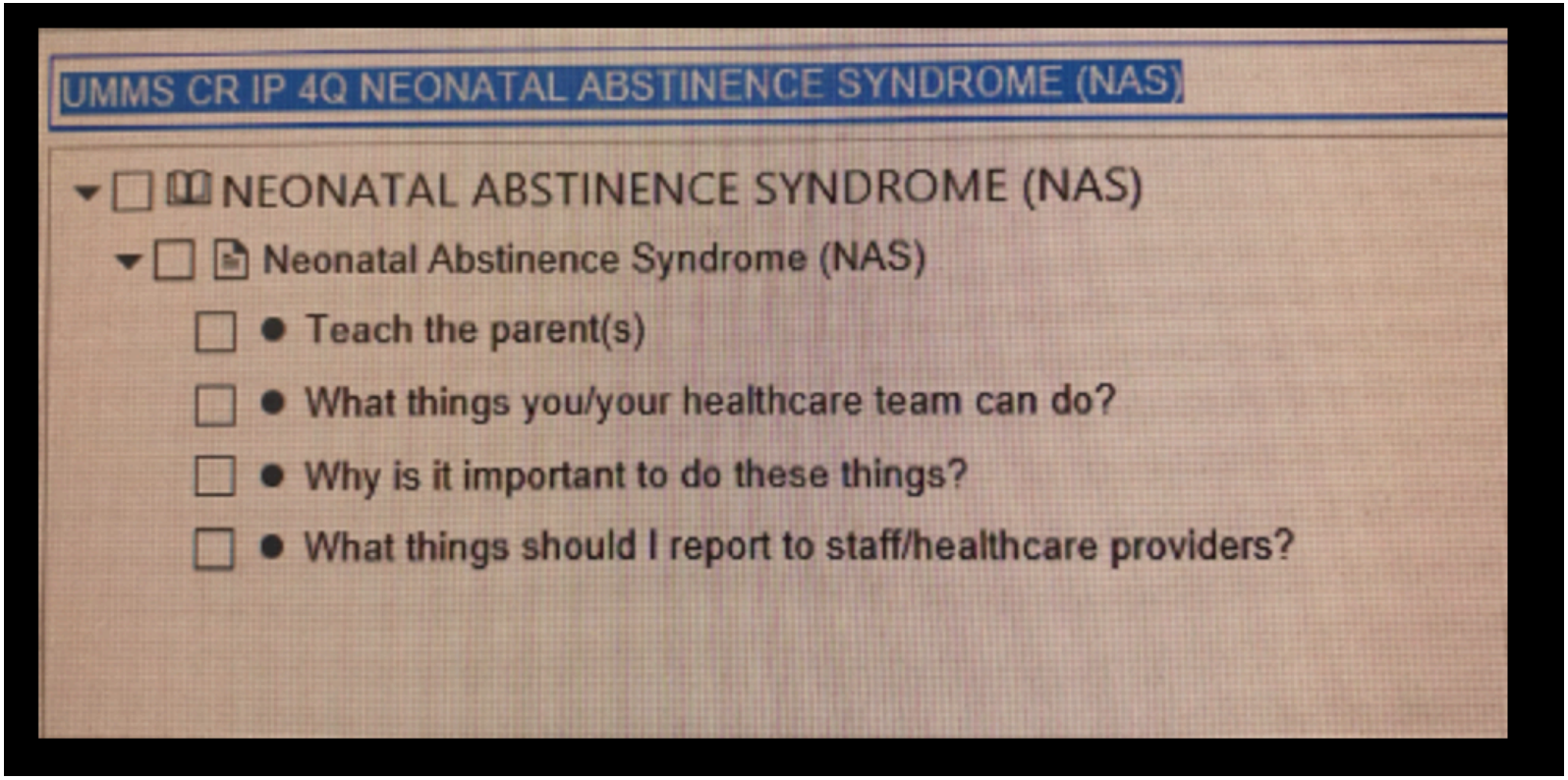
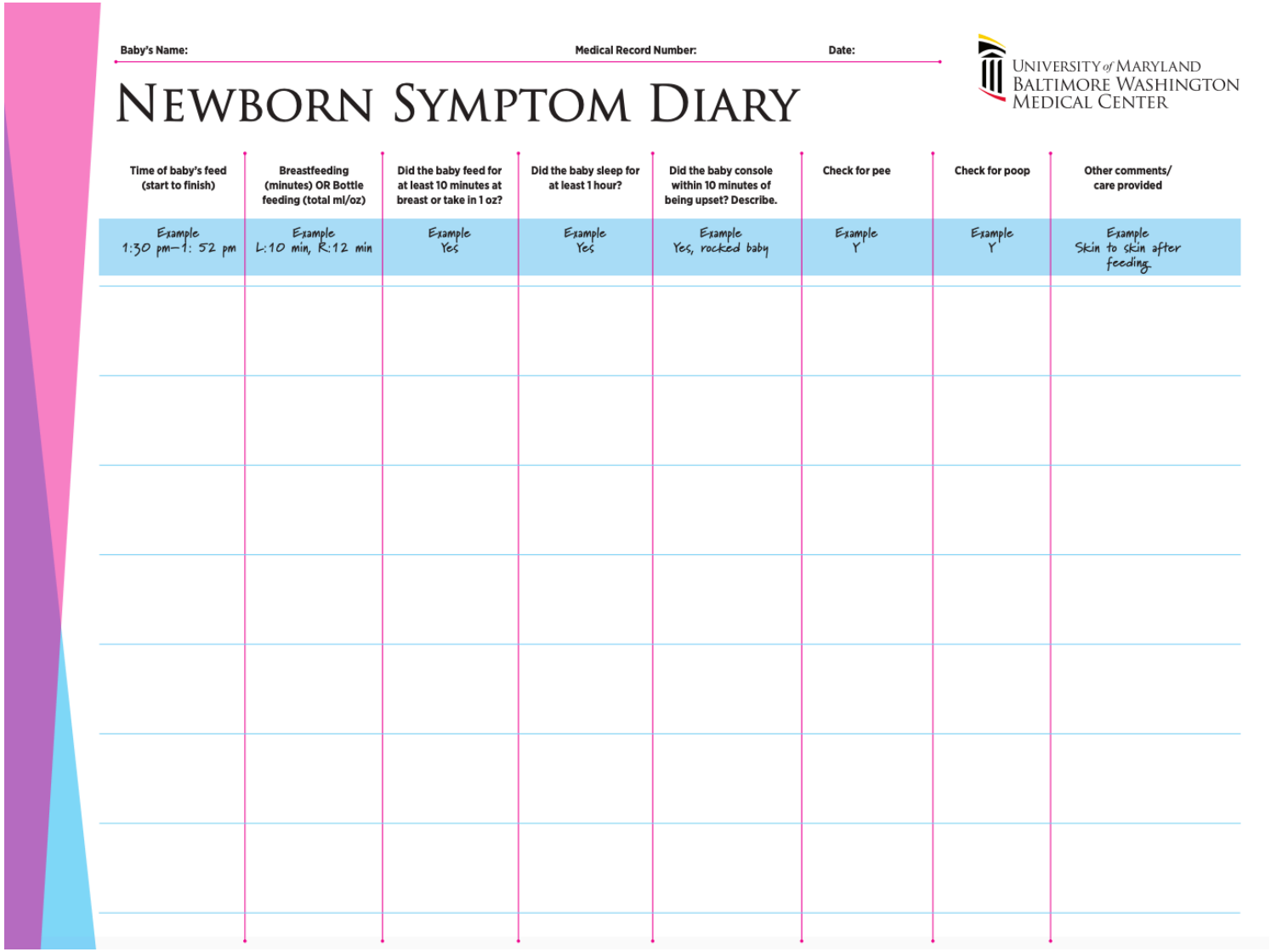


Figure 6.

Parent Symptom Tracker



Baby's Name: Medical Record Number: Date:

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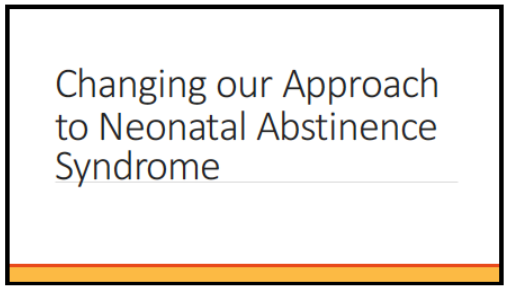
NEWBORN SYMPTOM DIARY

Time of baby's feed (start to finish)	Breastfeeding (minutes) OR Bottle feeding (total ml/oz)	Did the baby feed for at least 10 minutes at breast or take in 1 oz?	Did the baby sleep for at least 1 hour?	Did the baby console within 10 minutes of being upset? Describe.	Check for pee	Check for poop	Other comments/ care provided
Example 1:30 pm–1: 52 pm	Example L:10 min, R:12 min	Example Yes	Example Yes	Example Yes, rocked baby	Example Y	Example Y	Example Skin to skin after feeding

Figure 7.

Staff Education PowerPoint



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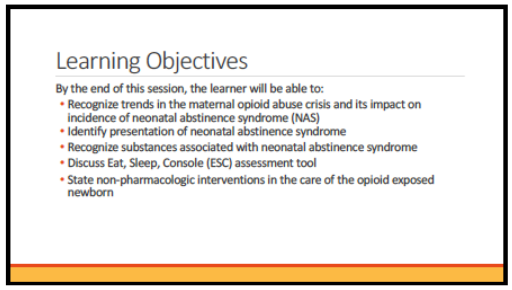

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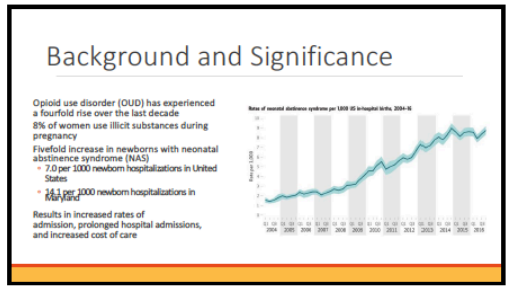

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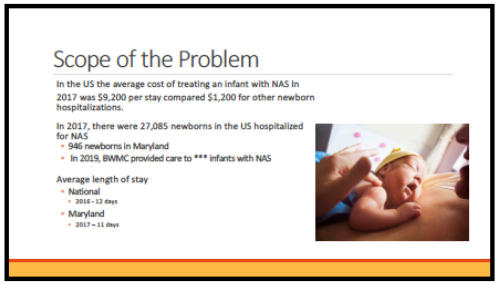

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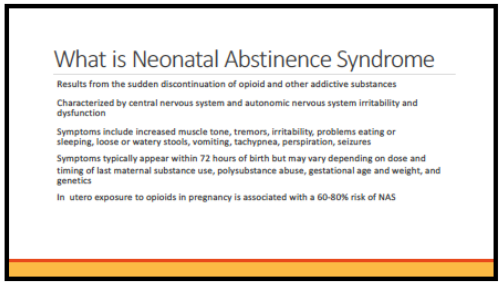

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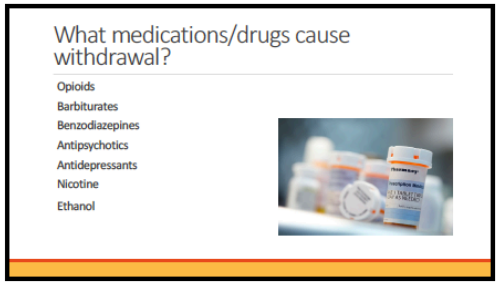


6

Signs of neonatal withdrawal

Most babies show signs of withdrawal 2 to 3 days after birth, but some may not show signs until day 4 or 5.

- Excessive or high-pitched cry
- Difficulty sleeping between feeds
- Irritability/increased respirations
- Tremors or jitteriness
- Inability to suck or excessive sucking
- Stuffy nose, sneezing
- Skin Mottling
- Fever/sweating
- Feeding difficulties/vomiting
- Diarrhea
- Weight loss/poor weight gain
- Skin breakdown

7

BWMC Birth Center Unit Goals

Provide a safe, judgement free, and supportive environment to families

Support maternal-newborn bonding

Support newborn transitioning while providing best care practices

Create a family centered approach to care

8

Standard Approach to NAS

Most institutions assess NAS severity through the Finnegan Tool

- Assigns a score based on 21 clinical signs of withdrawal, with scores ≥ 8 indicating need to initiate pharmacologic therapy.
- Has never been validated or tested
- Goal is to suppress withdrawal signs/symptoms
- Withdrawal symptoms may overlap with normal newborn behavior

Medication administration with morphine or methadone results in NICU/Nursery Admission, places staff as primary caregivers, and disrupts family centered care

9

Time to Reappraise our approach to NAS?

Medication has been the mainstay of treatment (ie morphine, methadone)

The American Academy of Pediatrics recommends a two-tiered approach to management of NAS: first provide nonpharmacologic interventions then provide medication treatment if nonpharmacologic therapies fail to control symptoms.

- **Nonpharmacologic care should be the initial approach to treatment.**

Recent data suggests functional based assessments can reduce medication use and length of stay of newborns.

New Approach: The infant with NAS should be able to perform basic functions of the newborn:

- Eat
- Sleep
- Be Consoled

Treatment: Parents are primary treatment

10

ESC Approach to Care

Eat	Sleep	Console
Eat – Able to eat at least 1 ounce/feed or breast feed well. If unable to eat (too sleepy or uncoordinated), consider placing a NG tube for feeding	Sleep – Able to sleep for at least 1 hour undisturbed (may have to be held to sleep)	Console – Should be able to be consoled within 10 minutes. Another person should try to console baby after 10 minutes.

11

Family Centered Approach to NAS

Mother is the main caregiver; other family members are encouraged to participate in care of the newborn.

- **Hugs before Drugs!**

Teach mother and family members:

- Signs of withdrawal
- Methods to console newborn:
  - Swaddle
  - Sway
- Plan of care
- Discharge planning

Remove barriers to family centered care:

- Rooming in
- Support breastfeeding
- Empower parents to provide care

12

Parent/Family Teaching

Review from Pamphlet:

- What is NAS?
- Signs/symptoms of withdrawal
- Medications and drugs that can cause withdrawal
- Plan of care during admission
- Methods to console newborn
- Assessment for withdrawal
- Discharge planning

Document this in the patient education section

13

Methods to Console

Rooming in

Skin to skin time

Swaddling/Cuddling

Feeding on demand

Calm environment

Keep noises to a minimum, keep lights dim, limit visitors

Respond to baby cues early

14

Integrating Family Centered NAS Care
Key Points

Identification of at-risk mother upon admission to Labor and Delivery

Toxicology screen sent on mother and newborn

Notify Social Work/Case Manager

Implement ESC approach

- Rooming in with mother and newborn – even after discharge
- Encourage breastfeeding if candidate
- Provide education and support on infant care
  - Empower mom/family
  - Parent handout: Neonatal Abstinence Syndrome and Welcome Letter
  - Smart text ESC patient education
- Promote teamwork: Mother-Staff huddles
- **Newborn Symptom Diary Form**

15

Integrating Family Centered NAS Care
Key Points

Provide nonjudgmental care to mother and newborn

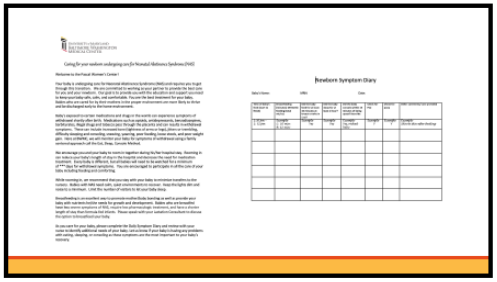
Nonpharmacologic care is primary! Use pharmacologic treatment to help baby function when needed (ie unable to Eat, Sleep, or Console)

Continue to monitor newborn for signs/symptoms of withdrawal until discharged.

Promote family centered care approach to empower families

Collaboration with community partners such as behavioral health, medication assisted treatment centers and other community partners that would be necessary to ensure a safe plan of care for mom and baby

16



Newborn Symptom Diary

17

Discharge planning

Provide education to parents regarding duration of NAS

- Symptoms may persist up to six months

Identify support system for home care

Document pediatrician follow up

Provide referrals and support contacts

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How do we measure success?

Short term

- Type and amount of medication doses
- Days in hospital, cost
- Parental presence at bedside
- Breast feeding
- Readmission rates
- Parent feedback

Long term

- Safe discharge of newborns
- Rate of child abuse
- Long term child development

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References

Grossman MR, Berkwitt AK, Osborn RR, et al. An Initiative to Improve the Quality of Care of Infants With Neonatal Abstinence Syndrome. Pediatrics. 2017;139(6). doi:10.1542/peds.2016-3360.

Grossman MR, Lipshaw MJ, Osborn RR, Berkwitt AK. A Novel Approach to Assessing Infants with Neonatal Abstinence Syndrome. Hospital Pediatrics. 2018;8(4):71-6. doi:10.1542.

Hoegin MA, Boyle C, Redfield RR. Public Health Surveillance of Prenatal Opioid Exposure in Mothers and Infants. Pediatrics. 2019;143(5):e20183801

Howard MB, Schiff DM, Penwill N, et al. Impact of Parental Presence at Infants' Bedside on Neonatal Abstinence Syndrome. Hospital Pediatrics. 2017. doi:10.1542/hpeds.2016-0147.

HCUP Fast Stats - Neonatal Abstinence Syndrome (NAS) Among Newborn Hospitalizations from https://hcupnet.ahrq.gov/HCUPnet.jsp?Id=

McQueen K, Murphy-Oikonen J. Neonatal Abstinence Syndrome. The New England Journal of Medicine. 2016;375:2468-2479. doi:10.1056.

Stover, MW, Davis, JM. Opioids in pregnancy and neonatal abstinence syndrome. Semin Perinatology. 2015; 39(7): 561-565. doi: 10.1053/j.semperi.2015.08.013

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Figure 8.

Staff Attitude and Knowledge Questionnaire

Staff Attitude and Knowledge Regarding Neonatal Abstinence Syndrome Care					
	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
I believe that the best place for newborns with NAS should be cared for in the special care nursery or NICU.					
I find it stressful or upsetting when caring for mothers of infants with NAS.					
I believe that mothers of infants with NAS cannot provide adequate care to their newborns.					
I feel confident in my ability to assess newborns with symptoms of NAS.					
I have received adequate training on the use of assessment tools used with infants with NAS.					
I believe that the score that I assign to newborns with NAS is accurate and objective.					
I believe that my unit has clear policies and protocols in caring for infants with NAS and their families.					
I believe that my unit has an environment that is appropriate to care for infants with NAS.					
I am knowledgeable about pharmacologic methods of pain relief for NAS.					
I frequently use nonpharmacologic interventions when care for a baby with NAS					
I encourage mothers of infants with NAS to breastfeed					