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Optimizing the Involvement of Women with Opioid Use Disorder in the Care of
Their Infants Experiencing Neonatal Abstinence Syndrome

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Abstract

The incidence of opioid use disorder (OUD) has grown to epidemic proportions. Infants exposed to opioids in utero are likely to experience withdrawal symptoms during the hours and days immediately following birth, known as Neonatal Abstinence Syndrome (NAS). Research indicates maximizing non-pharmacologic, supportive management decreases Neonatal Intensive Care Unit (NICU) admissions, the length of stay, and the severity of NAS. The purpose of this project is to evaluate the effects of an antepartum consult designed to prepare mothers with OUD to participate in this nonpharmacologic care. The Women and Infants Substance Help (WISH) Center delivers prenatal care for women with OUD. Women receiving care at WISH were given an antenatal consult to inform them of the proposed plan of care for their infant after delivery. Outcomes were compared to mothers from WISH who did not receive the consult, to assess the consistency of mothers rooming-in and breastfeeding to treat NAS in the first 5-7 days, as measured by whether the mother roomed-in with her baby, the percentage of babies who received their mother's milk, and the length of hospital stay for the baby. While there was a small improvement in these measures among the mothers who received the consult, it did not reach statistical significance. A secondary analysis supported existing studies which associated rooming-in and breastfeeding with shorter lengths of stay for infants. The overall success of this model of care warrants continuation. Further investigation is needed to identify and refine the factors which contribute to this success.

Introduction

The incidence of opioid use disorder (OUD) in the United States had grown to epidemic proportions. In 2014 the number of individuals who were nonmedical users of pain relievers was estimated at 4.3 million, with an additional 435,000 using heroin (Center for Behavioral Health Statistics and Quality, 2015). Women of childbearing age are no exception. The prevalence of OUD in pregnant women increased by 127% from 1998 to 2011 (Maeda, Bateman, Clancy, Creanga, & Leffert, 2014). Infants born to women with OUD are likely to experience withdrawal symptoms during the hours and days immediately following birth. This withdrawal is known as Neonatal Abstinence Syndrome (NAS).

The incidence of NAS per 1000 births/year between 2000 and 2012 increased from 1.2 to 5.8. In 2012 the mean length of hospital stay for unaffected newborns was 1.2 days with an associated cost per admission of \$3,500. For babies with NAS this increased to 16.9 days and \$66,700 (Patrick, Davis, Lehman & Cooper, 2015). A review of national trends in Neonatal Intensive Care Units (NICU) revealed the frequency of admissions for infants with NAS increased from 7 per 1000 in 2004 to 27 per 1000 in 2013. Over the same period, the average length of hospital stays for these infants increased from 13 to 19 days (Tolia et al., 2015).

Guidelines for the use of pharmacologic management of NAS symptoms are not consistent, but almost always result in the baby being admitted to the NICU. Once pharmacologic management is initiated, the baby receives multiple doses, which are slowly weaned. This scenario results in significant exposure to pharmacotherapy and separation of the mother and infant during a critical bonding time.

Current research indicates maximizing non-pharmacologic, supportive management decreases NICU admissions, the length of stay, and the severity of NAS (Grossman et al, 2017). The purpose of this project is to evaluate the effects of an antepartum consult designed to prepare OUD mothers to participate in the nonpharmacologic care of their newborns. In neonates experiencing NAS, how does a maternal preparation/education/ support intervention, compared to current procedures affect the consistency of mothers rooming-in and breastfeeding to treat NAS in the first 5-7 days, as measured by whether the mother rooms-in with her baby, the percentage of babies who receive their mother's milk, and the length of hospital stay for the baby?

Literature Review

The literature review was guided by a search of CINHALL, PubMed, Medline, and Google Scholar. The key term used was Neonatal Abstinence Syndrome. Then a variety of terms were added, including treatment, quality improvement, breastfeeding, and rooming-in, as well as opioid addiction, prenatal education or preparation, and pregnancy. Included in the search were primary research and review articles, professional and clinical guidelines, and quality improvement projects. Further investigation followed references from associated literature. Where possible, research and review articles were limited to those published since 2012.

Medication Assisted Treatment for pregnant women with OUD is the safest course of action but results in babies experiencing NAS (Hudak & Tan, 2012). These babies are at higher risk for long-term complications, but the quality of their parental relationships and home life can favorably affect outcomes (Baldacchino, Arbuckle, Petrie, & McCowan, 2015; Nygaard, Slinning, Moe & Walhovd, 2017; Oei et al., 201 Ornoy, 2003). Treatment for NAS is inconsistent and often leads to NICU admissions which separates mothers and babies at a critical bonding time (Bagley, Wachman, Holland &

Brogly, 2014). Women with OUD already face many unique environmental stressors, and this places them in an unwelcoming environment (Gopman, 2014; Atwood et al., 2016; Cleveland & Bonugli, 2014).

These combinations of factors have led healthcare providers to seek more compassionate, consistent, and evidence-based approaches to the treatment of NAS, which also have the potential for improving short and long-term outcomes. Two family-centered interventions for NAS that emphasize the mother-infant relationship are breastfeeding and rooming-in. These are simple, non-pharmacologic measures that place the mother at the center of the care of her baby and may improve outcomes for the mothers and infants (Edwards & Brown, 2016; Mcqueen & Murphy-Oikonen, 2016).

The management of infants at risk for NAS that includes standardization of protocols, an emphasis on non-pharmacologic interventions, and the use of alternative treatment approaches is associated with better infant outcomes (Grossman, Seashore, & Holmes, 2017). Implementing programs for NAS which emphasize parental presence, rooming-in with close contact between women with OUD and their newborns and avoiding NICU admissions demonstrated significant decreases in the percentage of infants requiring treatment with morphine, in the length of stay for these babies, and in the cost of treatment (Boucher, 2017; Howard et al., 2017; Holmes et al., 2016; Newman et al., 2015).

Breastfeeding is both safe and recommended in the context of OUD, provided the mother has demonstrated sufficient sobriety (Reece-Stremtan, Marinelli, & Academy of Breastfeeding Medicine, 2015). The amount of both methadone and buprenorphine that is present in mother's milk is clinically insignificant, regardless of the maternal dose (Hale & Rowe, 2016). Breastfeeding for the management of NAS has been shown to reduce the duration and severity of NAS symptoms, was associated with a decrease in

the need for pharmacologic treatment for NAS while promoting infant attachment and bonding, and shortened the length of stay compared to infants who were formula fed (Pritham, 2013; Short, Gannon & Abatemarco, 2016).

The value of rooming-in and breastfeeding for the treatment of babies with NAS is clearly demonstrated. These interventions improve immediate outcomes for babies, but also set the stage for improving longer-term outcomes by enhancing the relationship and strengthening the bond between parents and their babies. However, parents need to be informed in advance of the significant role they are expected to play during the first 5-7 days after birth, requiring a longer stay in the hospital. Without the active participation of the parents, neither of these interventions can be employed.

Published literature regarding evidence-based strategies to prepare, motivate, and engage parents with OUD in this process is sparse. While several authors refer to parental preparation in the overall treatment plan for babies with NAS (Grossman et al., 2017; Mcqueen & Murphy-Oikonen, 2016; McKeever, Spaeth-Brayton & Sheerin, 2014; Pritham, 2013; Sutter, Gopman & Leeman, 2017) only three studies were found that focused on the effects of a specific, prenatal education intervention involving women with OUD.

Newman et al. (2015) implemented an intervention which included antenatal education about the symptoms of NAS and nonpharmacologic strategies, along with training hospital staff to consistently assess NAS symptoms. This led to a successful transition to routine rooming-in for mothers with OUD and their babies and decreased the number of babies requiring pharmacotherapy and average length of stay. Crook and Brandon (2017) offered a series of three, prenatal breastfeeding classes to OUD women and measured the impact on subsequent breastfeeding rates and length of stay for infants with NAS. They found a statistically significant decrease in the length of stay,

but no significant increase in the breastfeeding rate. Finally, Giles, Ren, and Founds (2016) tested a prenatal educational intervention for OUD women, designed to increase knowledge regarding NAS and early parenting skills. They found no statistically significance difference in the women's knowledge scores pre-and post-intervention but did receive affirmation that the women perceived themselves more effectively prepared for the postpartum period after receiving the education.

A Protective Factors Framework informs this project. An educational intervention contributed to strengthening families by emphasizing the value of the parental presence, providing guidance and support, and teaching the parents appropriate strategies for caring for their infant. This helps build protective factors such as parental resilience, social connections, and knowledge of parenting and child development. According to the Protective Factors Framework, improving these protective factors result in strengthened families, optimal child development, and reduced likelihood of child abuse and neglect (The Center for the Study of Social Policy, 2017).

Method

The project's overall approach was program evaluation, in which a group of women receiving standard care were compared to a group who received an additional consult. The Women and Infants Substance Help (WISH) Center is located on the campus of SSM Health St. Mary's Hospital, and delivers prenatal care for women with OUD. Beginning January 22, 2018, women receiving prenatal care at WISH were given an antenatal consult designed to inform them of the proposed plan of care for their infant after delivery. The consult covered the topics as described in Appendix A (Antepartum Consult Topics) and was documented in the patient's chart.

The postpartum care setting was St. Mary's Hospital in St. Louis. Mothers and babies are cared for as a couplet and this unit sees an average of 14-20 opioid

dependent mothers and their newborns per month. A pilot project, modeled after the work of Grossman and colleagues from Yale New Haven Children's Hospital (Grossman et al., 2017) was initiated on November 6, 2017. A new method of assessing NAS symptoms was implemented, transitioning from the modified Finnegan Scoring System to the Eat/Sleep/Console assessment, all mothers were offered and encouraged to remain rooming-in with their baby after their own discharge, and pharmacologic treatment, when necessary, was given on a PRN basis and did not require an immediate transfer to NICU.

The sample from whom the data was collected included babies who were being observed for NAS at St. Mary's Hospital newborn nursery, and their mothers, during the period between November 6, 2017 and April 24, 2018. This provided for a comparison of approximately three months of data from women who delivered before the antenatal consults were initiated (November 6, 2017 to January 21, 2018), and three months of data for those who delivered after having the consult (January 22, 2018 to April 24, 2018). Only couplets in which the mothers received prenatal care at the WISH Center were included. Of this group, subjects were excluded if they did not receive the antenatal consult after it was initiated (January 22, 2018), or if the baby was admitted to NICU for medical reasons not related to the symptoms of NAS.

Administrative approval from both settings were provided by the Medical Director of the WISH Center, and the Director of Women's Services at St. Mary's Hospital. Human subject approval to conduct the project was granted from the Institutional Review Board (IRB) at the University of Missouri – St. Louis and the IRB at St. Mary's Hospital.

Results

Data was collected from 23 couplets before the consult was initiated, and 17 couplets in which the mother received the consult. (See Appendix B: Data Collection Sheet). Sample description and demographics from each group is displayed in Table 1. An Independent samples *t*-test was conducted to examine whether a significant difference existed between the mean length of stay for infants in the pre- and post-intervention groups. There was no significant difference found. A Chi-square analyses was performed to detect whether there was a relationship between receiving the consult and babies receiving their mom's milk. Due to the small sample size, a Fisher's Exact test was used to analyze the relationship between the consult and rooming-in. Neither of these relationships was found to be statistically significant. Fisher's exact tests were also performed and found no statically significant relationships between the consult and the baby receiving morphine or being admitted to NICU (Table 2).

A secondary analysis was performed to detect whether any of the variables were more frequently associated with another, by conducting Pearson correlation analyses. There was a significant positive correlation between rooming-in and infant's length of stay in days ($r_p = 0.44$, $p = .005$). The correlation coefficient between these two variables was 0.44 indicating a moderate effect size. This result indicates that as mom rooms-in less, the length of stay tends to increase.

A similar trend existed between mother's milk and length of stay. There was a significant positive correlation between receiving mom's milk and infant's length of stay ($r_p = 0.39$, $p = .014$). The correlation coefficient between these variables was 0.39 indicating a moderate effect size. This indicates that as the incidence of baby getting mom's milk decreases, the length of stay tends to increase.

And finally, there was a significant positive correlation between rooming-in and receiving mom's milk ($r_p = 0.41$, $p = .008$). The correlation coefficient between rooming-

in and receiving mom's milk was 0.41 indicating a moderate effect size. This indicates that as moms room in more, the incidence of baby receiving mom's milk tends to increase.

Discussion

While there was a clinical improvement in the key measures among the mothers who received the consult, the increase did not reach statistical significance. Due to the small sample size, it was not possible to effectively analyze the impact of the intervention. Another confounding factor was the hospital's concurrent implementation of a new model of care emphasizing rooming-in and non-pharmacologic treatment for babies being observed for NAS. While all couplets in this project were cared for using this model, it's application was being refined throughout this period. It is unknown what effect this had on the outcomes. The effects of these factors would be diminished with a larger sample size and a longer period of data collection.

Only couplets in which the mothers received prenatal care at the WISH Center were included in this project. While this provided a consistent prenatal experience, participants at the WISH Center routinely receive more specialized education at each visit. Repeating this project with mothers receiving prenatal care in non-specialized settings may produce different results.

The secondary analyses supported existing studies which associated rooming-in and breastfeeding with shorter lengths of stay for infants. The finding that rooming-in is associated with receiving mom's milk logically follows that breastfeeding and the availability of mother's milk could be compromised if a mother is not rooming-in.

While the results of this consult did not reach statistical significance, the clinical significance of this model of care should not be overlooked. There still exists great variability in the assessment and management of NAS. The average length of stay for

babies treated for NAS is being reported as at least 16 to 25 days (Pritham, 2013; Howard et al., 2017; Newman et al., 2015). After a rooming-in intervention, Newman and colleagues reported decreasing the length of stay to 8 days (Newman et al., 2015). Grossman and colleagues brought the average length of stay down to 5.9 days after applying a new method of assessment and focusing on nonpharmacologic care (Grossman et al., 2017). The practice in the hospital setting for this project is modeled after the latter, and achieved similar results. The pre-consult average length of stay was 6.17 days and the post-consult group was 5.65.

Future study should focus on the refinement of practices which support mother/family-centered, non-pharmacologic measures to treat infants at risk for NAS. In addition, research is needed to follow more long-term outcomes for these families. This would include associating the delivery of family-centered, nonpharmacologic care with the outcomes of child development and behavior, breastfeeding rates and duration, quality of mother-infant bonding, and family stability.

Conclusion

An antenatal consult designed to educate, motivate, and empower mothers with OUD to participate in the care of their newborns was delivered to women receiving prenatal care at a specialty clinic. A comparison was made between mothers from this clinic who received the consult and those who did not. While there was a clinical improvement in the number of babies who received their mom's milk, in the level of rooming-in, avoiding morphine treatment and NICU admissions, the relationship did not reach statistical significance. Likewise, although there was a slight decrease in the length of stay for the group whose mothers received the consult, the difference was not statistically significant. A secondary analysis supported existing studies which correlate

rooming-in and breastfeeding with shorter lengths of stays for infants, and correlated rooming-in with breastfeeding.

The overall success of the model of care implemented with this population during the study period warrants continuation. Further investigation is needed to identify and refine the factors which contribute to this success.

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Table 1

Participants' Description and Demographics

	Pre-intervention Group	Post-intervention Group	Total Subjects
Race/Ethnicity			
Caucasian	13 (57%)	15 (88%)	28 (70%)
African American	6 (26%)	2 (12%)	8 (20%)
Other	4 (17%)	0 (0%)	4 (10%)
Average Age/years	30.375	29.22	30.08
Receiving MAT			
Yes, Buprenorphine	13 (57%)	10 (59%)	23 (57.5%)
Yes, Methadone	9 (39%)	7 (41%)	16 (40%)
No	1 (4%)	0 (0%)	1 (2.5%)
Eligible to Provide Milk			
Yes	12 (52%)	12 (71%)	24 (60%)
No	11 (48%)	5 (29%)	16 (40%)

Table 2

Results from Statistical Analyses of variables compared to receiving/not receiving consult

Variable	Pre-intervention Group		Post-intervention Group		t	p	d
	M	SD	M	SD			
Length of Stay	6.17	2.46	5.65	1.00	0.93	.360	0.28

Note. Degrees of Freedom for the *t*-statistic = 38. *d* represents Cohen's *d*.

Variable	Chi-square Coefficient	Fisher's Exact Test Statistic
Receiving Mom's Milk	0.6282*	
Rooming-in		1.0*
Receiving Morphine		0.1229*
NICU Admission		0.4987*

*Not significant at $P \leq 0.05$

Appendix A

Antepartum Consult Topics

What is mom's role:

- You are the treatment
- Plan to stay until baby is discharged
- Discuss individual barriers/solutions
- Importance of breastfeeding if allowed

What to expect after delivery:

- Symptoms of NAS
- Hospital protocol for assessing baby
- Treatment without medicine
- Treatment with medicine

What can I do:

- Rooming-in
- Breastfeeding or pumping milk
- Keep lights, noise, visitors to a minimum
- Feed and comfort baby on demand
- Figure out what works best for your baby

Follow-up after going home:

- Choose baby's pediatrician and make first appointment
- Schedule for continuing appointments

Appendix B

Data Collection Sheet

Subject # _____

Mother age in years _____

Gestational age at the time of the consult _____

Race/Ethnicity:

1 = Caucasian, non-Hispanic

2 = African American

3 = Hispanic

4 = Other

MAT:

1 = Yes, buprenorphine

2 = Yes, methadone

3 = no

Milk OK:

1 = Mother was eligible to provide milk for baby.

2 = Mother was not eligible to provide milk for baby.

Infant Gender:

1 = Girl

2 = Boy

GA _____

Birth Weight _____

Discharge Weight _____

Room-in:

1 = Mother/family roomed-in until baby's discharge.

2 = Mother/family gave up room before baby's discharge.

Number of hours spent in the nursery _____

Ever milk:

1 = yes, received any mom's milk.

2 = no, did not receive any mom's milk.

Milk at dc:

1 = yes, Baby was still receiving mom's milk at discharge.

2 = no, Baby was not receiving mom's milk at discharge.

Baby's length of stay in days _____

Did the baby receive any doses of morphine?

1 = Yes

2 = No

If so, how many? _____

Was the baby admitted to NICU for NAS related issues?

1 = Yes

2 = No