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The Benefit of Neonatal Intensive Care Units Providing a Specialized Program for Newborns in Drug Withdraw

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An Investigation into the Benefits of Non-Pharmacological Therapy Options for Patients
Experiencing Neonatal Abstinence Syndrome

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Senior Honors Project

**Submitted in partial fulfillment of the graduation requirements
of the Westover Honors College**

Westover Honors College

May, 2020

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Abstract

Hospitals across America have intensive care units dedicated to neonates who are born with a wide variety of issues, with the hope that specialized care will promote healthy growth so the newborn can return home with its family. Unfortunately, the majority of the country is seeing an increase in neonates being born with drugs in their system from their mother's dependency during pregnancy. Delivering mothers who were addicted to opioids quadrupled between 1999-2004, which resulted in an increase of infants born with Neonatal Abstinence Syndrome from 1.2 per 1000 births in the year 2000 to 5.63 per 1000 births in 2012 (Kondili & Duryea, 2019). These babies are born with the substances circulating through their own body as a result of the drugs passing from the mother's system across the placenta into the baby. Shortly after birth these infants begin experiencing withdrawal from the substance since it is no longer being provided to them through the mother. The withdrawal process is similar to adults, although often negatively impacts the baby for both the short and long term future. The traditional method for treating these infants is to administer opioids to stop the withdrawal symptoms then slowly wean the baby from medication. Since the incidence of infant drug withdrawal is increasing, some Neonatal Intensive Care Units (NICU) have implemented programs and protocols for the withdrawal that promote healing and comfort without using medications alone. This has not yet become a widely accepted practice due to lack of funding or space (Mangat, Schmolzer & Kraft, 2019). This review of literature will investigate why these specialized programs are needed and in what ways the program benefits these babies.

Introduction

During 2017 roughly 2.6 million people were addicted to and/or misused opioids in America (Kondili & Duryea, 2019). It is clear that opioid misuse has severely impacted this country, which has resulted in a direct effect on medical centers. One medical specialty that has been altered by the crisis is women's and children's units. Between 2009 and 2017 the amount of women using heroin and prescription pain medication doubled (Kondili & Duryea, 2019). Specifically, the statistics show that the amount of women admitted to labor and delivery units who had an opioid problem quadrupled between the years 1999 and 2014 (Kondili & Duryea, 2019). Therefore, the country's medical systems have made big changes in order to treat these opioid dependent babies.

Due to the rise of pregnant women using drugs there is also a growing rate of newborns who are born also addicted to the substance (Kondili & Duryea, 2019). Just like all nutrients, the drugs are passed from the mother to fetus via placental perfusion of blood. Each drug has varying transportation pathways, peak times, and addiction rates. But no matter the substance (even alcohol), it will reach fetal circulation. The drug affects the fetus in similar ways as it does to an adult; stimulants will result in an increased heart rate, rapid movement, and central nervous system stimulation, while a depressant will slow heart rate, decrease movement, and suppress the central nervous system (MacMullen, Dulski & Blobaum, 2014). In utero the fetus will be affected by the drug, but it is not until post-delivery that the true impacts of his/her mother's addiction will truly begin to manifest itself. Once the umbilical cord is cut, the newborn is no longer receiving any blood or nutrition from the mother; this includes a halt of the drug circulating. Therefore, the newborn has now entered the withdrawal period, better known as Neonatal Abstinence Syndrome (NAS). Withdrawal post-delivery can occur from any form of an

addictive substance – opioids, prescription medications, alcohol, and marijuana. NAS is seen in 55-94% of newborns who had a drug-dependent mother (Ghazanfarpour et al., 2019). The symptoms of withdrawal do not occur immediately after birth, but rather present themselves once the substance level reaches below the threshold that the infant was expecting in utero. The onset of symptoms ranges from a few hours post-delivery up to eight days (Ghazanfarpour et al., 2019). “The effect of drugs on body system is also influenced by the type of drug, the combination of drugs, the amount and frequency of use, the trimester in which the drug was used, the timing of withdrawal, and the genetic susceptibility of the fetus/neonate” (MacMullen, Dulski & Blobaum, 2014). There is evidence to believe that many NAS patients were poly-drug exposed (mother used more than one substance), which also results in varying onsets and symptoms. (Konduli & Duryea, 2019).

The overall statistics show that the average length of stay in a neonatal intensive care unit for NAS patients is 16 days (Wachman, Schiff & Silverstein, 2018). NAS patients are in need of these lengthy stays due to the severe symptoms that accompany this syndrome. The hallmark signs are high pitched cry, diarrhea, excessive sucking, insomnia, irritability, sneezing, regurgitation, and mottling of the skin (Neonatal Abstinence Syndrome, 2014). The intensity of the symptoms varies with the substance used during pregnancy, but overall these are the classic signs of NAS. The diagnosis of NAS is made by a neonatal provider via prior knowledge of maternal ingestion, blood screening, or urine analysis (Neonatal Abstinence Syndrome, 2014). Once a diagnosis is made a full evaluation and work up must be done on the infant and he/she will likely be transferred from the postpartum unit to the NICU for closer monitoring. As previously discussed, the onset of symptoms varies so there must be frequent monitoring of the newborn to assess when the withdrawal officially begins which will then dictate the treatment

options. The most popular assessment tool for medical staff to assess NAS patients is the Finnegan scoring system; 65-95% of NICUs across America using this system to score their infant patients (Ryan et al., 2017). This scoring assessment form monitors different symptoms expected in newborn with NAS including: gastrointestinal upset (loose stool, vomiting, poor feeding), respiratory indicators (tachypnea, sneezing, congestion), tremors (either disturbed or undisturbed), amount of time sleeping, presence of moro reflex, muscle tone, rectal temperature, and irritability level (Mangat, Schmolzer & Kraft, 2019). If the newborn presents with the sign or symptom, then points are added to their overall score. If the score is greater than eight the baby is considered in active withdrawal and will be diagnosed with Neonatal Abstinence Syndrome (Ryan et al., 2017). The overall score can drastically change within a shift, so the nurses are scheduled to complete this assessment every two hours on average (Neonatal Abstinence Syndrome, 2014). Due to the extended time period in between assessments the nurse includes all observations seen between the scorings, not just score based on symptoms seen at that very moment because it could alter the system. The Finnegan system has proven to be very effective in allowing providers and nurses to make a successful plan of care in managing the newborns symptoms via treatment options.

The traditional mode of treatment for NAS patients is to administer opioids once the patient begins displaying symptoms. In order to prevent such a drastic withdrawal for the patient, giving them an opioid such as morphine will soothe their symptoms. The overall goal of this therapy is to slowly wean the medication dosages over time so the withdrawal occurs slowly where the symptoms can be managed. “Goals of pharmacological therapy are to relieve infant discomfort, allow proper nutrition and development, and to foster parental bonding.” (Mangat, Schmolzer & Kraft, 2019). Pharmacological therapy is usually given when an infant receives a

Finnegan score of greater than 8 on two consecutive assessments (Kondili & Duryea, 2019). The two medications that are most often prescribed for NAS are morphine and methadone (Mangat, Schmolzer & Kraft, 2019). Morphine is an opioid agonist, which means that it inhibits the neural cell receptor sites to prevent signals of pain from traveling to the brain. This medication is the most widely used opioid to treat NAS with 80% of NICUs in America prescribing it as the first line therapy option (Mangat, Schmolzer & Kraft, 2019). The dosing is up to the provider's discretion but is usually started on a higher dose and weaned off after the Finnegan scoring drops below eight consistently for forty-eight hours (Neonatal Abstinence Syndrome, 2014). Another medication given to treat NAS is methadone, which is another opioid agonist and works in similar ways to morphine. Methadone is used far less with only 20% of health systems prescribing this therapy option (Mangat, Schmolzer & Kraft, 2019).

Regardless of the medication prescription, the chain of action is similar once the first dose is given. During the initiation phase a higher dose of the opioid is given, which will hopefully decrease the scoring and allow the infant relief of symptoms. The assessments still continue to monitor any status changes. Two roads are possible now that the first dose is given: either the baby can respond negatively and have a Finnegan score of greater than or equal to eight which will prompt the provider to increase the dose in order to reach therapeutic levels, or the baby can respond positively and drop the scoring below eight which will result in a stable dose for forty-eight hours (Mangat, Schmolzer & Kraft, 2019). The weaning phase occurs after the baby's scores have stabilized for forty-eight hours (Mangat, Schmolzer & Kraft, 2019). In this phase the dosages will be decreased over time to the point of stopping the medication completely. Many infants will enter the weaning phase only to have to be increased again, just because their bodies were not able to tolerate the decreased dose (Neonatal Abstinence

Syndrome, 2014). Each baby is different, so the phases will look different for each one; it may take a week or a month, but this is the pharmacological treatment platform.

Pharmacological treatment is first line management once Finnegan scoring reaches greater than an eight because it is the less expensive option, requires less medical staff interaction and time, and has rapid results with the proper dosing (Neonatal Abstinence Syndrome, 2014). As stated before the average NICU stay for an infant experiencing NAS is 16 days (Wachman, Schiff & Silverstein, 2018). The days spent in an ICU are very expensive for the patient and the hospital system, so any method to decrease the length of stay is positive. The average cost for a NAS infant to stay in a NICU is \$2,700 per day (MacMullen, Dulski & Blobaum, 2014). These costs come from medical staff, procedures, medications, room and board, charting systems, and feedings. Again, this high cost motivates medical staff and parents to decrease the length of stay. While pharmacological treatment options are needed and effective, there are other forms of treatment that have been proven to decrease length of stay for NAS patients. These therapies exclude medication administration but focus more on the newborn's environment. The purpose of this literature review is to examine the ways in which the previously stated non-pharmacological treatment options benefit infants experiencing withdrawal. The thesis will argue that these therapy options have a large enough benefit for Neonatal Intensive Care Units to implement the practices in their protocols for patients diagnosed with NAS.

Methodology

This thesis will be a literature review of previous research projects and articles pertaining to this topic of non-pharmacological therapies for Neonatal Abstinence Syndrome (NAS) patients. This thesis investigates the major treatment options that are being conducted in

hospitals in the United States. The paper explores each option's success rate in relation to length of stay, syndrome symptoms, and medication dosages. Data bases searched were CINHAL, Medline, and Google Scholar. The paper uses a few news articles concerning the implementation of this type of therapy in hospitals local to Lynchburg. Some search terms used were: "NAS treatment", "Non-pharmacological therapy for NAS", "Pods for NAS", "Medications for NAS" and "Rooming In for NAS".

Environmental Modifications

The simplest non-pharmacological treatment options that require less money, time, and energy include alterations in the newborn's environment while staying in the NICU. Due to these patients being hypersensitive to noise, light, and movement simple changes in their atmosphere can have a large impact on length of stay, medication administration, and overall wellbeing (MacMullen, Dulski & Blobaum, 2014). Some of these environmental changes are employed with the typical baby in the NICU, but it is even more pertinent for NAS patients. Swaddling the baby, which involves wrapping a blanket tightly around the child, is a commonly used practice in most newborns to promote feelings of security, increased sleeping time, prevent waking, and assist in overall betterment of the infant (Ryan et al., 2017). There are countless studies proving the benefits of swaddling in the newborn, but specific research has yet to be conducted relating swaddling to the NAS patient specifically. The current literature shows that when done properly, swaddling reduces crying, lengthens sleep, and assists with comfort in the average newborn (Thompson, 2003). Yet ties can be drawn from the benefits for the average newborn to NAS. Since NAS patients have an increased sensitivity to movement and insomnia, it is clear that if

swaddling decreases these symptoms in the healthy newborn it will especially help these patients. It is a widely accepted practice in NICUs that is effective for infants regardless of diagnosis (Mangat, Schmolzer & Kraft, 2019).

Another simple, yet effective measure is to place these infants in the prone position (on their stomachs). While positioning newborns in this fashion is warned against at home due to the risk of Sudden Infant Death Syndrome, it has been proven effective for NAS when monitoring of the heart rate is constant and nursing checks are frequent (Mangat, Schmolzer & Kraft, 2019). Positioning the infant in this manner has proven to cause greater sleeping times, decreased arousal, stable respiratory patterns, and effective heart rhythms (Mangat, Schmolzer & Kraft, 2019). A study compared the Finnegan scores for infants lying in the prone position versus supine and found that the prone positioned patients had lower scores overall than the supine by two points (Mangat, Schmolzer & Kraft, 2019). It is thought that proning infants has a positive effect on the cardiac and respiratory systems, causing relaxation (Mangat, Schmolzer & Kraft, 2019). This is a very simple task for nurses to put into practice with their NAS patients because it requires no extra skills, finances, or much more time but produces positive outcomes.

In traditional NICUs each patient has a bassinet crib or incubator to lie in that provides safety, comfort, and warmth. These beds are ideal for the average baby, but studies have proven that waterbeds actually improve NAS symptoms. While these beds will cost the medical system more money than the typical bed, the benefits for NAS make the cost worthwhile. A study of NAS patients placed on waterbeds showed that these patients had a decrease in medication dosage by 2 milligrams per kilogram, decreased Finnegan scores, and began gaining weight earlier than patients in typical cribs (Ryan et al., 2017). The outstanding benefits of these

waterbeds ought to outweigh the costs for NICUs as a means for decreasing the symptoms of NAS.

Changes to the environment for NAS patients has shown to make a difference in their overall wellbeing and symptoms. The average NICU is a place with bright overhead lighting and constant noise of machines, crying, and voices – not an ideal environment for hypersensitive newborns. Any way to decrease the stimulation for an infant experiencing NAS will only bring about positive improvements for their scores, length of stay, and medication administration. One way to combat the environmental commotion is to create low-stimuli pods. The pods are separate areas for the NAS infants to reside in while completing their treatment at the hospital. It has lower light, decreased amount of noise, and areas for parents to sit alongside their newborn. The pods create an ideal environment for the withdrawal period by largely decreasing stimuli. A hospital in Lynchburg, Virginia recently constructed pods for their NAS population. Centra Health, also seeing a growing rate of NAS patient's coming into their hospital, decided to combat this issue by creating the pods to assist their patients. The Women's and Children's manager, Shannon Miles, stated, "Part of the initiative is to have these neonatal pods that are available so moms can be at the bedside with their infants, they can hold their infants, do skin to skin, breastfeed if they want to, pump if they need to, and have privacy. They will have the lights down for dimness, have quiet time – all these things that a baby who might experience neonatal absence will need." (Centrahealth.com, 2018). Hospitals, like Centra Health, are implementing these pods because of research that proves the benefits. One study in particular showed that NAS infants who were placed in low stimuli environments had a 50% decrease in their average length of stay (Grossman et al, 2017). While constructing these pods is an expensive undertaking, it truly does help the babies combat this syndrome in an ideal environment. But unfortunately,

hospitals in America do not have plentiful financial reserves that can be used to construct pods. This is not to say that the low stimuli environment idea has to be completely abandoned. There are still ways that nurses can help create this atmosphere within the NICU by placing their bed in a corner of the unit, away from doors and the nurses station to decrease sound. They can also be sure that ceiling lights are not directly over the crib and in the baby's eyes. Another simple way to decrease stimulation is to cluster nursing care as much as possible. This means that the nurse can construct her tasks during the day to take place at once instead of waking the baby more than it needs to be. Nurses can cluster the baby's morning assessment, feeding, and medication administration together so that sleep is promoted. These are simple ways that the environment can be set up to encourage rest and comfort for NAS patients who are hypersensitive to their surroundings.

Feeding and Nutrition

A topic of investigation and research surrounding NAS patients is their feeding schedule, method, and nutrition. There are differing opinions concerning the safety of breastfeeding when a mother is on drugs because of the fear that substance could yet again travel into the newborn's system via breast milk. Although many providers are still very cautious about NAS patients breastfeeding, evidence has shown that breastfeeding is a safe and therapeutic way of nutrition. Research has been done on mothers taking opioid substitution therapies to treat their addiction, including methadone and buprenorphine (Mangat, Schmolzer & Kraft, 2019). Research does not support the implementation of breastfeeding for mothers still using illicit drugs because those substances will have harmful effects for the baby (Ryan et al., 2017). Two studies looked at the concentrations of methadone in the breastmilk of mothers taking 40-200 mg per day; research showed that only 2% of the drug was being excreted in the milk to be available for the newborn,

which would decrease even more due to the low bioavailability of oral intake (Ryan et al., 2017). There have been no detrimental effects to the newborns after receiving breastmilk from mothers on opioid-substitution therapies (Mangat, Schmolzer & Kraft, 2019). In the maternal and fetal medicine world breastfeeding is the golden standard for promoting newborn growth and development regardless of newborn status. Not only does breastfeeding have numerous benefits for the healthy newborn, it also assists NAS patients as well. Evidence has shown that NAS babies who are breastfed have consistently lower symptoms than formula-fed individuals. “A retrospective chart review of 190 drug-dependent mother-infant-dyads showed reduced NAS severity within the first 9 days and delayed onset, 25% reduction in need for pharmacological treatment, and up to 20-day decrease in lengths of pharmacological treatment, regardless of gestation and type of drug exposure when compared to formula fed.” (Mangat, Schmolzer & Kraft, 2019). Another study showed a decrease of 7 days in the overall length of stay for breastfed NAS patients over formula fed (Mangat, Schmolzer & Kraft, 2019). The benefits of breastfeeding are clear, but it is difficult to put into practice because the babies are often separated from the mother during hospital stay, and the willingness to breastfeed of this maternal population is low.

A statistical study shows that only 24% of mothers who gave birth to NAS babies will breastfeed (MacMullen, Dulski & Blobaum, 2014). The small percentage that does breastfeed drops by 60% after 6 days post-delivery (MacMullen, Dulski & Blobaum, 2014). The causes for this low percentage is largely caused by a lack of education prenatally and during the postpartum period (MacMullen, Dulski & Blobaum, 2014). Many of these mothers do not seek care prenatally due to lack of finances or other resources. They may also be afraid of the outcomes due to their drug dependence. Once the baby is born, the focus immediately goes to decreasing

NAS symptoms via medications and much of the other non-pharmacological treatment options are pushed to the side or not fully explained to the mother (Ryan et al., 2017). Some hospitals are starting initiatives to increase the rates of breastfeeding by following steps outlined by Baby friendly Inc. and decreasing barriers to breastfeeding noticed within their facility (Ryan et al., 2017). Another major issue is the physical separation during hospital stay because the baby is admitted to NICU and the mother to postpartum, so in order for her to breastfeed she would need to come to the ICU every feeding, which is a large barrier for many new moms. A possible solution for this issue is to allow the mother to pump as needed in order to consistently feed the infant breastmilk rather than switching between formula. The skin to skin contact would not be occurring with pumping, but the nutritional benefits of breastmilk would still be present.

Since there is such a low rate of breastfeeding in this population, formula feeding techniques and methods must be considered. Some of the symptoms of NAS affect the gastrointestinal tract which results in diarrhea, regurgitation, excessive sucking, and poor feeding in general (MacMullen, Dulski & Blobaum, 2014). These issues easily lead to inadequate nutrition which results in low weight and delayed development for the newborn. Practices must be put in place to decrease and prevent this from happening so the infant can be discharged earlier and be on track for target developmental milestones/growth. The formula itself is often prescribed by the neonatal provider to best suit the baby's needs. NAS patients need to be placed on formulas with high calories and/or sensitive ingredients to prevent regurgitation and reflux (MacMullen, Dulski & Blobaum, 2014). Since they are prone to GI upset due to their syndrome, the formula often needs to be changed and revised until it seems to work well for the patient. The schedule that seems to work best for these infants is small meals that occur on a frequent basis to ensure that the largest amount can be fully digested before another feed (MacMullen, Dulski &

Blobaum, 2014). Sometimes gavage feeding is needed for these infants because their sucking reflex is overstimulated, and they just cannot ingest the milk. Gavage feeding is a method to offer nutrition to infants who cannot swallow and/or suck properly. A nasogastric tube is placed, which allows formula or breastmilk to bypass the mouth and esophagus to directly enter the stomach for digestion. Often times as the syndrome's symptoms decrease, the baby will begin sucking normally, but while withdrawal is occurring, gavage feeding may be necessary (MacMullen, Dulski & Blobaum, 2014). Another method for assisting these infants with feeding is to attach a slow flow nipple to the bottle. This allows the baby to take in a more moderate and appropriate amount of formula even though they are having an excessive suck. Also making sure to position the baby in an upright position after feeding to promote digestion and prevent regurgitation can be helpful in promoting proper nutrition. As previously stated, breastfeeding is by far the optimal method of nutrition for this population, but since the rates of this occurring are low, other feeding methods are available to help prevent and/or decrease gastrointestinal upset in these patients.

Another issue that arises with NAS feedings is the very high rates of disruptive infant behaviors that result in inadequate intake. One study examined the behaviors of infants during feedings and found that 51% of the feeding time the infants were expressing fussiness and crying (Maguire et al, 2015). Other characteristics that are common for NAS patients to express during feedings are sleeping and sedation where they are not interested in eating (Maguire et al, 2015). This can make feedings very difficult to attempt and especially be successful with. NICU staff must teach mothers and caregivers about the expected characteristics of their baby during feedings so they do not become overwhelmed or hopeless. The feeding time is a very important educational opportunity for nurses to teach about symptoms and why the baby is acting fussy.

NAS infant character is another limitation in breastfeeding, but with proper education and preparedness it is a hurdle that can be crossed.

Therapeutic Therapies

A non-pharmacological therapy option that has recently gained traction to warrant research is providing acupuncture for NAS patients to decrease their symptoms. While the current research is limited, the findings are showing positive outcomes. There are two main types of acupuncture studied with the NAS population. The first is traditional acupuncture that involves inserting a small needle into the top layers of the skin to stimulate different pressure points of the body (Boucher, 2017). The National Acupuncture Detoxification Association/NADA recommends inserting the needles at three points along the ear in newborns to produce the most successful effect (Boucher, 2017). Another type is laser acupuncture which is a non-invasive form that imitates acupuncture points by using a laser beam on low power (Mangat, Schmolzer & Kraft, 2019). With either form it is theorized that this therapeutic procedure works by releasing dopamine into the blood stream. Acupuncture helps patients in drug withdrawal because, during a high from opioids, large amounts of dopamine are released just like is occurring during the acupuncture procedure (Mangat, Schmolzer & Kraft, 2019). A research study compared 14 infants who were receiving morphine administration and acupuncture therapy versus 14 infants who were being administered the medication solely. The findings concluded that the infants getting acupuncture had a large decrease in the average time they continued to receive the medication over the patients only getting morphine by 11 days (Ryan et al., 2017). Other trials have been conducted but have led to inconclusive answers, which leads medical providers to accept this therapy as an option but not encourage every NAS patient to receive it until further investigation is completed (Boucher, 2019).

Irritability is a classic symptom of NAS that produces a high-pitched cry which is almost impossible to console without the assistance of a soothing technique. Due to the hypersensitive state these babies are in, anything can send them into a complete wreck which also will negatively affect their vital signs, leading to hypertension, inadequate oxygen exchange, and tachycardia (Neonatal Abstinence Syndrome, 2014). All too often NICU nurses are given a high patient load and cannot care for two or more NAS infants at once. They truly need one-on-one attention to console them and decrease their stimulation; unfortunately, the shortage of nurses in America right now makes that unable to be a reality. So nurses look for anyway to console their patients, even if it is for long enough to complete charting or talk with the provider. An option that is used in the newborn population, but often for small procedures, is oral sucrose. Often nurses or providers will drop this sucrose/sugar water on the infant's tongue or dip their pacifier in the liquid to produce a calming disposition. Sucrose given orally is a mild analgesic that is given to reduce pain (Kedrick, 2018). It has a calming effect for newborns that only last 5-8 minutes, so it is a good choice to reduce pain for the short term (Kedrick, 2018). Some traditional uses for sucrose administration are: heel sticks, IV insertion, lumbar punctures, dressing changes, injections, circumcision, enemas, and nasogastric tube insertions (Kedrick, 2018). NICU nurses caught onto the idea that sucrose calms infants during these procedures, therefore it ought to relieve distress in NAS infants. As previously stated, its effect wears off quickly so back up plans must be in place to console the infant, but for a short term fix sucrose can console an irritable patient. One issue that can arise from giving sucrose is raising the infant's blood glucose level to unsafe ranges. Because of this possibility there is daily maximum doses recommended to give newborns (Kedrick, 2018). The maximum dose for a baby between birth to one month of age is 5 milliliters (Kedrick, 2018). So the nurse must keep track of this to monitor the baby's intake of

sucrose to ensure the dose does not overstep the maximum range. This is a safe therapeutic measure to take when NAS patients become inconsolable and prevents an increase of Finnegan scores which will avoid an increase of medication dose.

The third and final therapeutic therapy option that hospitals can put in place to help newborns go through withdrawal is starting a volunteer program for people to “cuddle” the babies. It is unrealistic to think that NICU nurses can sit and hold their NAS patients all day, but in reality that is what they truly need to be calm and decrease their symptoms (Kraynek, Patterson & Westbrook, 2012). A great way to combat this is implementing a program for people to offer their time to hold the babies for periods throughout the day. The volunteers must go through background checks, screening, and education before coming to the unit. They also will be checked on frequently by the nurse and will be able to get in touch with him/her if an issue arises. The safety measures are a top priority for the staff so, per unit protocol, the baby is always monitored via EKG, pulse oximetry, and identification location bands. The cuddlers do not only benefit the time management of the nursing staff, they have also proven to help the baby’s withdrawal symptoms (Kraynek, Patterson & Westbrook, 2012). Western Pennsylvania Hospital began a study to see if their cuddler program actually helped the patients. A group of NAS patients with cuddlers was compared to a group who were not in the program. Their findings showed that the babies who were cuddled had a decreased length of stay by 3.8 days on average (Kraynek, Patterson & Westbrook, 2012). This confirmed that the program was viable and truly did have major positive effects on their NAS population. And in two years this hospital’s volunteers had completed 2,855 hours of cuddling NAS babies (Kraynek, Patterson & Westbrook, 2012). This program is low cost because the people are volunteering 100% of their time and energy to the babies; the only cost is education. Many of the volunteers truly enjoy the

programs because of a personal connection they have with the population or unit in general. David Deutchman is known as the “ICU Grandpa” at Children’s Healthcare of Atlanta because he has been giving his time to the unit for 12 years and because of the special baby touch he seems to have on all the fussy patients (Vieira, 2017). The cuddler program has had such a great impact that Huggies diapers has started an initiative called “No Baby Unhugged” which is trying to create these programs at hospitals in Canada currently (No Baby Unhugged, 2020). Their tag line for this program says “Huggies Brand has always believed in the power of hugs. And we want to help ensure all babies get the hugs they need, even when moms and dads can’t be there to give them.” (No Baby Unhugged, 2020). This is an inexpensive way that NICUs across the country are able to decrease the withdrawal symptoms without medications.

Rooming-In

The most important non-pharmacological therapy option that seems to have the most benefits for these infants is rooming-in with their mothers. Most infants will be transported to the NICU once signs and symptoms of withdrawal begin so that they can be watched more closely and administered medications on a regular basis. This instantly separates the mother-infant-dyad which results in harmful outcomes for the baby and mother-baby bond. “Such a prolonged admission is disruptive to the infant’s family and is likely to interfere with mother and infant bonding.” (Saiki et al, 2009). Hospital systems have recognized this issue and came up with a possible way to combat the problem. A solution is for the mother and baby to be kept together during this withdrawal period so that bonding and overall wellbeing of the relationship can continue. The benefits of rooming-in are higher incidences of breastfeeding, lower medication dosages, decreased length of stay, lower Finnegan scores, and possible lower overall associated costs (Mangat, Schmolzer & Kraft, 2019). Many studies have been done on the effectiveness of

rooming in on breastfeeding rates. One study found that 63% of infants rooming in with their opioid-dependent mothers were breastfeeding in the hospital, while only 10% of infants left in the NICU to withdrawal were being breastfed (Mangat, Schmolzer & Kraft, 2019). Since the baby is in close proximity to the mother, breastfeeding is logistically a much easier task than traveling from postpartum or home every two hours; it was previously noted the great benefits that breastfeeding can have on NAS, so any encouragement to increase the rate is a positive thing. Rooming-in has also shown to decrease the length of stay for this population. A research study completed in 2017 compared 86 mother-infant pairs and found that the overall length of stay was reduced by nine days for babies allowed to room-in with their mothers (Kondili & Duryea, 2019). Another study showed that rooming-in decreased the length of stay from 41.5 days to 33 days (Boucher, 2017). Lowering the time of hospital stay is mostly due to the lower medication dosages that are prescribed during the hospital stay because of their mother's impact. Research has shown that NAS patients rooming-in required 20-60% less medication treatment than for babies who stayed in the ICU (Wachman, Schiff & Silverstein, 2018). Their overall time of taking these medications is also reduced by 8 days on average (Mangat, Schmolzer & Kraft, 2019). While more studies need to be completed, the findings thus far indicate a positive outcome for rooming-in. The majority of NAS babies are transported to the NICU for worthy reasons – vital sign changes, medication dosing, closer monitoring, and controlling the symptoms. While these are all valid motives for transferring units, the benefits of leaving them with moms need to be considered.

While allowing the babies to stay with mom may be best, there are many logistical issues that arise when creating a program to allow mothers to stay with their newborns. To begin with the medical staff needs to remember that the mother is the beginning reason that the baby is

going through NAS, so the infant's safety needs to be priority before allowing them to stay in a room alone with mom (Mangat, Schmolzer & Kraft, 2019). There may be unsafe situations that prevent the baby from being kept with mom and in that situation it is much better for baby to be placed in the NICU's safe environment (Mangat, Schmolzer & Kraft, 2019). NICUs that are creating rooming-in options require the mother to be in some sort of program to end their addiction that includes urine screening, opioid replacement medications, counseling, and home visits (Mangat, Schmolzer & Kraft, 2019). The mother has to prove to the hospital, her addiction program, and child protective services that she is on a path of breaking her addiction so the baby will have a safe home environment after discharge (Mangat, Schmolzer & Kraft, 2019).

Addiction is a difficult battle to overcome, so this may not be an option for some mothers who are unwilling to treat their problem. The staffing strategy creates another issue with rooming-in because the infant truly needs an ICU provider and nurse completing frequent checks and assessments instead of a postpartum or pediatric nurse whose education and daily assignments are different. This is much more difficult to do when the baby is not feet away from the nurse's desk, but rather the nurse has to travel some distance to do her checks. Staffing arrangements must be reconsidered when rooming-in is offered. Another issue that arises when the hospital is trying to create an opportunity for rooming-in is finding the space to accommodate the mom and infant. Some hospitals have created a whole new unit/section for rooming-in, but that has large costs associated with it (Ryan et al, 2017). Others have given them open rooms in the postpartum or pediatrics units as that is available. But census changes often, so those rooms may be needed by critical patients. The 'where to place them' question is the largest issue surrounding this opportunity. If a rooming location can be negotiated, rooming-in actually has proven to decrease the cost of NAS infant's hospital stay.

A comprehensive study was completed for the Society for Maternal-Fetal Medicine concerning the overwhelming costs of NAS admissions. The investigators looked at newborns with NAS across the country to gather data on the costs regarding length of stay if rooming-in or staying in the ICU. They found that the average cost of stay for an NAS infant who was administered pharmacological therapy in the NICU was \$22,432 (Avram, 2019). Average cost of stay for neonates rooming in with mom and administered medications dropped significantly, to \$9,469 (Avram, 2019). This large difference is caused by how much less medication has to be administered, less staff time, more breastfeeding rather than using formula, and less medical intervention. This study concluded that rooming-in decreased costs in 94.2% of their patients (Avram, 2019). This cost comes from hospitals that already have placement for the mother-infant dyad and does not include the hospital's costs for either building a new space or taking rooms away from a nearby unit. So, while ultimately it decreases costs, there must first be major financial dedication to organizing a rooming-in program. This is the largest issue for hospitals and why the majority of them have not opened a rooming-in option for the NAS mothers. Hospital system must look to the research to see the great benefits that rooming in can offer their NAS patients before declining to invest.

Discussion

The benefits of implementing non-pharmacological therapy protocols for patients experiencing NAS is clear. The actual choice and implementation stages of this process can look very different from hospital to hospital; but the traditional methods of solely treating these patients with medications alone should no longer be the case. Budgets are different depending on the area and size of the hospital system, but some of these interventions like providing low stimulus, encouraging breastfeeding, positioning, and family education have little to no cost

associated with them. NICUs need to begin educating their staff about these ways to decrease withdrawal without medications solely. Steps can be made in the right direction for these patients in order to decrease their symptoms and length of stay in addition to or without the use of medications.

Some of the limitations surrounding this thesis would be that these treatment options have not yet been accepted widely, so the research surrounding the information is limited. As the years go on and hospitals recognize the benefits of these therapies more information will be published. Another limitation encountered during this project is the lack of personal information that can be publically distributed due to HIPPA regulations for patient privacy and confidentiality. This made it difficult to find personal stories or information from patients or parents that could further my different points.

Conclusion

NICUs across America are seeing an ever growing number of infants presenting in withdrawal from their mother taking addictive substances during pregnancy. Neonatal Abstinence Syndrome has reached a level where hospitals are having to come up with new ways to combat the issue and care for their patients. The traditional way of administering opioids once withdrawal symptoms appear should no longer be the first line treatment. While there are situations where medication must be given to treat the patient, non-pharmacological therapies should be considered first in the majority of cases. Noting to the fact that the healthcare system in America is struggling for dollars, there are many ways to treat the infant without going broke. Controlling their environment to be low stimuli really helps these hypersensitive infants overcome their withdrawal period. This can be as simple as turning the light off over their crib, completing cluster care as a medical professional, and placing their bassinet in the quietest area

of the unit. The units can even create low-stimuli pods to promote their healing as well. Other simple ways to control their environment are positioning them in the prone position, placing them on a waterbed instead of traditional mattress, and swaddling them. Education about breastfeeding prenatally and postpartum can do wonders for these babies entering withdrawal. Breastfeeding has been proven to decrease medication administration doses and lower length of stay. If breastfeeding is not an option, then the type of formula should be tailored to promote growth and healing in these patients. Also, holding them upright after feeds, giving them a slow-flow nipple, and doing small frequent feeds will help decrease their GI upset. Some therapeutic options to help treat NAS withdrawal is acupuncture, giving oral sucrose, and creating a cuddler volunteer program. All of these things are low cost and have proven to be very effective. Finally, a more expensive but very effective method to non-pharmacologically combat NAS is allowing the mothers to room-in with their babies after birth. While it is associated with higher costs initially and can create some administrative issues, the research shows that it greatly benefits these patients by decreasing stay, decreasing medication administration, promoting breastfeeding, and lowering final costs for the patient. These are successful ways hospitals can deal with the ever growing issue of increased NAS infants being admitted without using medication.

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