The Opioid Dependent Mother and Newborn Dyad: Nonpharmacologic Care

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Abstract: Opioid dependent pregnant and postpartum women and their infants are a complex and vulnerable population requiring individualized, comprehensive, and multidisciplinary treatment. Though methadone maintenance in the setting of comprehensive service provision during pregnancy significantly improves pregnancy outcomes for opioid dependent women, its use has implications for the infant, most notably the neonatal abstinence syndrome. Neonatal abstinence syndrome is comprised of physiologic signs and behaviors that indicate a dysfunctional regulation of the central and autonomic nervous systems, and is variable in its expression in affected infants. The disorganized rather than adaptive behaviors displayed by each infant undergoing the effects of in utero opioid exposure may impair basic functions such as feeding, sleeping, and the ability to be alert and communicate clear cues to caregivers. Understanding and responding to neurobehavioral dysfunction of the newborn may help to promote the infant's self-organization and self-regulating abilities. However, the substance abusing mother's physical and psychologic wellbeing may be debilitated in the perinatal period, and her ability to recognize and respond to the newborn's cues may be limited. A multitiered comprehensive assessment and intervention of the methadone-maintained mother, her child, and the mother/infant dyad can improve early maternal nurturing interactions, a crucial component of early infant development, particularly in this vulnerable population. The purpose of this article is to review the contribution of maternal opioid dependency to the difficulties experienced by the mother-infant dyad and their treatment providers in the postnatal period, and the nonpharmacologic treatment of the infants with suggestions for practical measures with emphasis on the treatment of the mother and baby as an interactional dyad.

Key Words: neonatal abstinence syndrome, methadone, substance abuse, opioid, infant

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The infant with neonatal abstinence syndrome (NAS) and his mother present a complex and frequently difficult dyad to adequately assess and treat. Nearly all opioid exposed infants will display symptoms of NAS,[1] however, only a subset require pharmacotherapy.[2] Nonpharmacologic care of the opioid exposed newborn refers to the careful evaluation of the infant and his mother, provision of nursing/caregiving interventions, and modification of the environment and social interactions that support his/her neurodevelopmental and physiological stability. Nonpharmacologic care is not intended to substitute for pharmacologic treatment of those infants requiring medication but should be the standard of care for all infants at risk for NAS. An essential component of nonpharmacologic care is the education and facilitation of maternal involvement with the infant.

Each infant displaying NAS has a particular level of maturation and style of processing and responding to environmental stimuli and caregiver's cues, contributing to the variability of expression of NAS. Infants display different NAS symptoms with different intensity over time. Therefore, appropriate supportive care of the in utero opioid exposed infant requires a thorough examination and accurate identification of the individual physiologic and behavioral expressions of NAS in each infant, triggers of its symptoms, and an individualized plan to modify the environment and caregiver's interactions. These signs can be difficult to interpret in a dysregulated newborn experiencing NAS. In addition, although the substance dependent woman frequently wants to understand and help her newborn, she may lack the training or emotional ability to recognize the behaviors of her baby and support the infant's efforts to become stable and well-organized.

There is sparse empirical literature regarding the nonpharmacologic care of drug exposed neonates. Interventions that have been reported to support neurobehavioral functioning in drug exposed neonates, but not systematically evaluated, include swaddling, the provision of a quiet environment and pacifier use.[3–5] Most supportive care plans for neonates with NAS are regarded as standard (eg, swaddling, small feedings, pacifier), regardless of the infant's individual functional and developmental characteristics, capacity for NAS expression and self-organization. Waterbeds have been reported to improve neurobehavioral functioning in opiate exposed infants[6]; conversely, rocking beds have been shown to increase withdrawal symptoms in this group.[7] An individualized nonpharmacologic care plan should seek to support the infant's autonomic, sensory, motor and interactive develop-

ment based on the specific signs and behaviors displayed by the infant. The infant's behaviors will determine the modifications of the environment, the specific comforting techniques needed and the consolidation of patterns of activity, timing for nursing interventions, feeding, and rest. Also necessary in optimal care of the infant experiencing NAS is an assessment of maternal wellbeing and what the newborn is receiving from her that promotes or impedes his neurophysiological functioning and developmental progress. The population of opioid exposed infants exhibit many characteristics found in infants with regulatory disorders,[8] and other high risk populations, including cocaine exposed infants and preterm infants. These characteristics, which include dysfunction in autonomic regulation, sleep/wake control, motor, attentional/interaction, and self-regulatory systems have been previously well defined in these populations.[9–12] Therefore, the parenting/supportive strategies applied in the care of other high risk populations have been applied to the opioid exposed newborn in this review of nonpharmacologic interventions. The purpose of this article is to provide an overview of the opioid dependent mother and her contribution to the infant's neurobehavioral profile, and practical guidelines for health care providers for the assessment and nonpharmacologic treatment of methadone-exposed mother-infant dyad. The discussions and recommendations provided will assist health care providers with (1) recognizing the behaviors and physiological signs exhibited by the individual newborn undergoing NAS, (2) responding with techniques that positively affect the newborn's neurobehavior, organization, and maturation, (3) better understanding of the needs of the complex population of opioid dependent and methadone maintained postpartum women, and (4) viewing the opioid exposed infant as one aspect of a dyad and the need for simultaneous treatment of both the infant and the mother.

THE OPIOID DEPENDENT POSTPARTUM WOMAN

Addiction is a chronic disorder of the brain that can result in highly complex behavioral symptoms driving destructive choices and actions in substance dependent mothers, many or all of which have direct implications for the wellbeing of the infant. At the core of addiction there is a compulsive and uncontrollable drug craving, seeking and use.[13,14] The mother loses ability to control her life, rearranging her motivational priorities and putting drug-seeking and drug-taking behavior as a life priority at the expense of most other activities, even when faced with negative consequences, such as the loss of child custody, or continuing use when the drugs do not produce pleasurable effects.[15] There are several factors that increase the risk of addiction, including biologic (genetic, gender, mental disorders) factors, environmental (chaotic home, abuse, peer influences, etc.) factors, and characteristics of the drug itself (type of drug, route, early use)[16,17]. Therefore, each chemically dependent mother brings to the dyad her own capabilities to care for the newborn depending on her developmental history, addiction severity, comorbid disorders and support system. It has been suggested, for example, that mood disorders and substance abuse might hijack the mother's motivation and reward systems, and alter infant-related reward perception and salience.[18] This in turn may interfere with maternal self- and mutual-regulation of affect,[19] maternal responses, mother-infant attachment, and thereby infant/child development (Fig. 1).

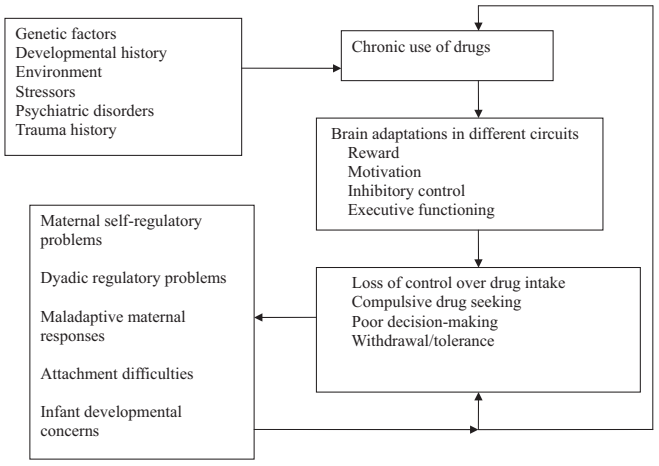

FIGURE 1. The neurobiological impact of addiction on maternal functioning and the mother-infant dyad.

The most effective treatment for opioid dependent pregnant women simultaneously provides pharmacological (ie, methadone), behavioral and social services interventions.[20–23] Methadone maintenance offers clear benefits to the pregnant/postpartum woman, including improved health care, reduced infant mortality,[24] decreased illicit opiate use,[25–27] improved substance abuse treatment retention,[28] and stabilization of chaotic environments and behaviors by reducing drug seeking behaviors such as prostitution.[23] However, methadone treatment is only one component of the multitiered and comprehensive treatment approach for this population of women. Pregnant and postpartum women receiving methadone need specialized assessment and treatment for psychiatric problems, mental health counseling to include individual and/or group therapy, and intensive social support (to include financial, legal, housing, child welfare and domestic violence services). Women receiving comprehensive care of this nature during and after their pregnancy are more prepared to deal with the physical, emotional, and maternal demands of the perinatal and postpartum periods. Pain control, requirements for changing methadone dosing and physical fatigue in the immediate postpartum period need to be differentiated from fatigue related to demands of the care of the baby, postpartum depression or relapse. These conditions may interfere with the ability to respond properly to the infant and to provide nurturing interactions, and each woman should be evaluated for each of these conditions. Health care providers in different settings providing care to the mother/infant dyad are in an ideal situation to assess and advocate for the mother and the infant. Risky behaviors detected in the mother during the postpartum period (ie, sedation, signs of relapse, postpartum depression) need to be assessed by any provider involved with the dyad. After a nonjudgmental direct observation of the mother, mother/infant dyad and exploration of

the maternal status with her substance abuse treatment counselor, a decision about the maternal postpartum care plan and neonatal care plan in tandem should be formulated. Unfortunately, deeply held cultural beliefs and negative stereotypes frequently result in punitive responses toward the opioid dependent pregnant and parenting woman by the providers who are most poised to positively impact the mother and child.[29,30]

THE OPIOID EXPOSED MOTHER/INFANT DYAD

Research during the last decades supports the notion that the infant's relational experience with the environment and caregivers during the first years strongly influences the neuroanatomical (brain organization, hardwiring of sensorimotor pathways) and physiological (brain bioamine metabolism) development.[10] The infant's behaviors, including hypertonicity, tremors, facial expressions, cry and, state control influence the behavior of the newborn's caretaker.[31] These behaviors can be challenging, especially for the opioid dependent mother, and difficulties in the dyadic processes of regulation may lead to altered developmental and interactive trajectories in the infant.[32] Multiple factors affect the mother's emotional and physical availability to help regulate and organize her newborn when exhibiting NAS. First, methadone maintained women frequently find it particularly emotionally difficult to see their newborns displaying symptoms of NAS related to methadone exposure. Maternal guilt and anxiety, insecurity about her ability to parent because of poor parental role modeling, the loss of other children and a lack of self-esteem are common among this population of women. If in addition she lacks the ability to recognize these feelings, modulate them, and take the appropriate actions on behalf of herself and her child, maladaptive behaviors such as relapse, aggressive behaviors with relatives or health care providers, and/or neglect of the baby may be the outcome. Second, partners, relatives and occasionally health care providers seeing the newborn with NAS overtly or covertly blame the mother for her drug dependency and/or receiving methadone during pregnancy, increasing maternal distress or precipitating abusive or violent confrontations. Third, it has been suggested that maternal substance abuse, mood disorders and adverse childhood experiences may influence maternal responses to newborn cues.[33–35] Distorted interpretations of the infant's signs based on her own mental working models (what the mother thinks and feels about herself and her newborn) lead the mothers to characterize their newborns as "good," "difficult," "stubborn," "gassy," etc. based on their behaviors. These interpretations drive maternal responses that can impact the organization of the infant and initiate developmental trajectories that can promulgate behavioral, emotional, or interactional problems. Finally, the above factors or symptoms of maternal mood disorders may affect maternal responses to the baby and in turn his organizational capacity. For example, depressed mothers may have difficulty tolerating infant irritability or may have trouble finding the energy to appropriately stimulate a newborn that displays low arousability or difficulty with interaction.[36,37] Mothers with uncontrolled symptoms of anxiety or attention deficit hyperactivity disorder can be loud and intrusive, and their handling of the baby too vigorous for an easily overstimulated infant.

By examining the newborn in the presence of the mother, the provider can demonstrate the range of the infant's physiological and behavioral competencies and weaknesses, as well as adaptive or maladaptive responses to external stimulation. At the same time the maternal responses to each displayed newborn sign can be observed. Attention to maternal reactions and behaviors can direct the intervention with the dyad to diminish emotional overload and provide external organization until the infant can develop higher sensory limits and consistent behavioral self-regulation.[9] Helping the mother to be aware of her emotions, behaviors driven by those emotions, and her capacity to regulate them may improve her ability to respond to the infant and thereby the mother infant interaction.[38–40] It is necessary to address maternal perceptions of the newborn's condition and cues (realistic vs distorted), behavioral patterns, and responsiveness to external and internal stimuli. This in turn may lessen or ameliorate emotional and developmental problems in the baby, facilitate mother-infant interaction and decrease the risk for abuse or neglect.

THE OPIOID EXPOSED INFANT

Each newborn has a rich and complex set of behaviors for regulating his internal states and interactions with the environment.[31] NAS can be seen as a group of physiological signs and behaviors that indicate a dysregulation of the newborn's behavioral repertoire and functioning.[2] Using a model adapted from the Synactive Theory of Development[9] as a framework to conceptualize the assessment of the infant's functional repertoire and ability to regulate his responses, the following infant's neurobehavioral domains are critical to a comprehensive assessment of the infant with NAS: (1) reactivity to sensory stimulation, (2) behavioral states and state regulation, (3) motor and tone control, and (4) autonomic signs of stress. Individual NAS symptoms are a product of dysregulation of one or more of these domains, and the NAS expression varies based on the infant's capacity in each of these areas. These domains are interrelated and influence each other, as are the variety of signs and behaviors expressed by the infant. Dysregulation in one or more of these domains may interfere with basic neonatal functions such as feeding, sleeping, growth, emotional regulation, or social interaction (Fig. 2).

Reactivity to Sensory Stimulation and Regulatory Issues

"Sensory processing" or "sensory integration" refers to the ability to take in information through each of the sensory systems (visual, auditory, tactile, vestibular, and proprioceptive), process and organize that information, and give meaningful motor, attentional, and emotional responses according to the stimuli. Infants who struggle to integrate sensory input become overwhelmed by regular sensory signals such as lights, regular sounds, touch, movement and internal body signals, which may hamper the newborn basic functioning.[41] Each newborn with NAS has a unique profile of responses to

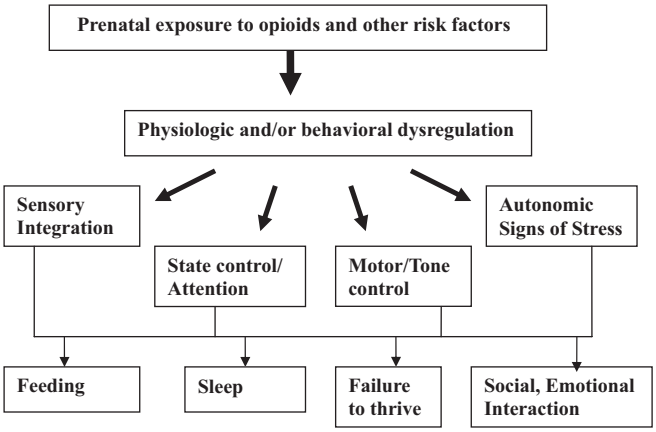

FIGURE 2. The neurobiological domains and functions of the infant who are affected by neonatal abstinence syndrome.

sensory stimuli, but very frequently displays nonadaptive responses that suggest deficits in the nervous system's ability to receive, filter, organize, and integrate stimulatory input. For example, infants undergoing NAS with a high level of reactiveness, can respond to regular caregiver initiation of social interactions such as eye contact, voice or light touch with irritability (vocal or nonvocal), erratic movements of the limbs, or signs of stress such us spitting up, bowel movements, hiccups, etc. Other infants may become quiet, close their eyes, and ignore any sensory stimulation (pull down). These difficulties with self-regulation of sensory input make the infant appear overresponsive or underresponsive.

Behavioral States and State Control

The newborn's sleep-wake states indicate both his own endogenous regulatory processes and the effects of exogenous influences from the environment, and are traditionally defined as a distinct group of physiological signs and behaviors, ranging from deep sleep, quiet sleep, drowsy, quiet awake, active awake, to crying. The expression of behavioral states reflects the infant's nervous system maturity and neuroregulatory capacity.[12,42] Opioid exposed infants may not be able to achieve the entire range of states, may have difficulty in managing the transition between various states, and/or spend larger amounts of time in 1 state (ie, crying or somnolent). These infants move quickly from state to state (ie, asleep to crying) with little cueing, which is termed state lability. They may display sleep deprivation (reduction in the percentage of sleep state compared with controls), disorganization (increased amount of sleep in indeterminate sleep or sleep that does not meet criteria for quiet or active sleep), and fragmentation (more shifts from sleep to wakefulness precipitated by arousals) (Fig. 3).[43]

Behavioral states influence many aspects of the neonatal neurobehavioral functioning[44] with each behavior occurring primarily in a specific sleep-wake state. Furthermore, the severity of some behaviors can be defined by its presence in a particular state. For example, jitteriness is considered mild if the tremors occur only during sleep or crying states or after the administration of the Moro reflex, and moderate to severe when observed during quiet alert states or consistently in several states when evaluating infants experiencing NAS.[45]

The expression of NAS symptomatology depends on the infant's state and the infant's ability to modulate between states. For example, infants who remain primarily in a sleep state will express NAS symptomatology differently from infants who frequently attain an insulated cry state. Neither infant may be able to achieve the quiet alert state necessary for social interaction because of a lack of ability to modulate their arousal. Newborns with poor neurobehavioral adaptational skills will protect themselves by shutting off external stimuli (pull down) to provide a barrier to stimulation in response to an overstimulating environment, even though these stimuli may be minimal. Such infants seem to be hypersomnolent or difficult to arouse. Conversely, other infants unable to adapt to environmental stimuli become irritable, fussy, and hypertonic and actively disengage from communicating; for example, by averting their faces and arching their backs when presented with eye contact. These infants may actually be in a similar overstimulated state as the somnolent infant, and each would require different caregiver techniques to help them to modulate their arousal.

Crying is a behavior that precipitates attention from the caregiver. The crying infant requires careful evaluation to determine the appropriate response. Most frequently, crying represents the newborn's way of communicating his basic needs (diaper change, hunger, and fatigue). In some infants with NAS crying may represent difficulty in managing stimuli, or can be a hallmark of poor state regulation and difficulties with modulation of arousal. These infants cannot be easily consoled and/or cannot use self-consoling behaviors, and excessive energy is expended on maintaining physiological balance. Infant crying frequently produce maternal guilt and anxiety or potentiate postpartum depression, which may further amplify the expression of NAS or trigger abuse if the mother is impaired and unable to deal with the infant's irritability.

Motor and Tone Control

Infants experiencing NAS frequently display hypertonicity, exaggerated primitive reflexes (ie, Moro), changes in tone, and/or may have asymmetric tonal changes or fluctuating levels of tone. Infants with NAS frequently display tremors, uncoordinated movements, startles and various jerky movements that can be present in all states but are more pronounced in irritable or crying states. Although tremors are the most common involuntary movement of healthy full-term infants, found in 20% to 50% of low-risk newborns, they are seen with greater frequency (88%) among opioid exposed newborns.[44] They can be triggered by any stimuli or no apparent stimuli. These movements may produce great anxiety for the mother and family.

Another motor control problem not infrequently encountered in opioid-exposed newborns is myoclonic jerking. Myclonic jerks are abrupt, jerking movements of the extremities or face occurring during sleep states. These movements may or may not be isolated to 1 arm, leg or one side of the body, can involve the face and chin, and do not stop when the extremity is held. Myclonic jerking is common in opioid

exposed infants and must be differentiated from seizure activity.

Suck/swallow incoordination, improper positioning of the tongue on the nipple, and poor latching to breast or bottle may be other motor derived symptoms of NAS. This can result in the infant failing to take in enough calories to grow because of inadequate formula intake or loss of formula or breastmilk from the sides of the mouth, resulting in failure to thrive. Infants with suck/swallow incoordination often produce a clicking noise and/or may take in more than usual amount of air during feeding, leading to gastrointestinal upset.

Autonomic Signs of Stress

Behavioral signs of stress that indicate a dysregulation of the autonomic nervous system are frequent among infants undergoing NAS. They are a reflection of difficulties in continuous regulation of this portion of the nervous system, which provides afferent and efferent (parasympathetic and sympathetic) feedback loops for the purpose of homeostasis and postnatal adaptation. This dysregulation, combined with internal and external stressors, produce symptoms frequently called autonomic signs of stress[45,46] such as color changes, mottling, tachypnea, hiccups, gagging, spitting up, sneezing, yawning, sighs, bowel sounds, or frequent bowel movements. Vomiting and loose stools may be signs of dysregulation of the autonomic nervous system and these symptoms may be severe enough to cause the infant to fail to thrive, though not usually. These symptoms should be viewed as signs of stress and treated as such if other organic causes are ruled out, as symptoms of NAS frequently overlap. As with other infant behaviors, stress signs are state dependent. Tachypnea, for example, can only be interpreted during quiet states.

Several factors may influence the individual newborn's response to a stressor, including the type of stressor, intensity of the stressful stimulus, morbidity status, behavioral state, and infant gestational or postconceptional age.[47] In the case of NAS it has been found that premature and full-term infants prenatally exposed to opioides have different courses of NAS, with preterm infants having shorter lengths of hospital stay and less medication requirements than full term infants.[48,49] It is not clear why preterm infants do not exhibit similar patterns of withdrawal as term infants. Studies in behaviors among nondrug exposed preterm infants suggest that significant changes in infant behavior occur over the time period from preterm birth to 40 weeks of gestation. These changes involved the absolute percentage of each expressed behavior and the percentages of each behavior expressed within each sleeping and waking state.[50] For example, negative facial expressions increased over the preterm period; sighs, startle/jerks, jitters, and the likelihood of having hiccups decreased. All behaviors showed state-related differences in frequency, and only startle/jerks and jitters showed the same developmental patterns within each state, leading to the conclusion that preterm infant behaviors cannot be used clinically for assessment without consideration of the state in which they occur.

NONPHARMACOLOGIC INTERVENTIONS FOR INFANTS WITH NAS

Reactivity to Sensory Stimulation and Regulatory Issues

In general, for hyper- or underresponsive infants the room should be quiet, with dim light, and the infant handled in a soft, slow manner using stimuli that the caretaker has

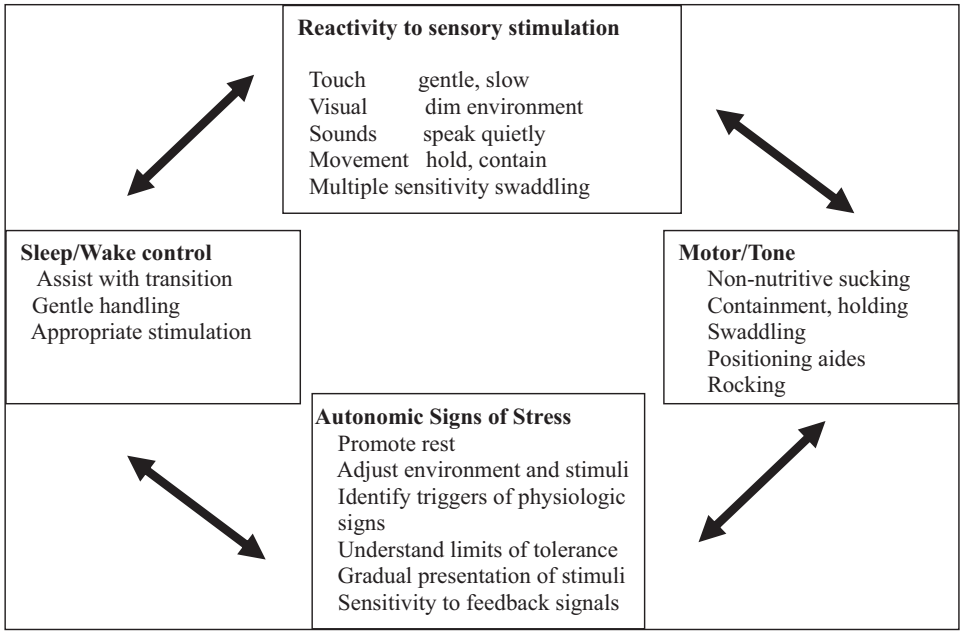

FIGURE 3. Nonpharmacologic care by domain for the infant affected by neonatal abstinence syndrome.

FIGURE 4. Positioning to soothe the infant with NAS.

determined to be manageable to the infant. In addition, specific holding/containing techniques, such as holding the newborn's hands against his chest in a supine or side position, providing firm but gentle pressure to the trunk or head, and/or swaddling frequently help the baby to better tolerate stimulation (See Fig. 4). Some infants who have difficulty regulating sensory input may display self-soothing abilities, such as bringing the hands to the mouth or self-clinging. Mothers should be taught the beneficial implications of the ability to self soothe. A pacifier is helpful for hypersensitive infants in both organizing a dysregulated infant and in preventing disorganization of the infant during care routines. For example, upper extremity containment and nonnutritive sucking can be useful while changing a diaper for an infant sensitive to touch, temperature change or kinesthetic stimuli.

Behavioral States and State Control

Awareness of the different behavioral states and the importance of recognizing the infant's ability to regulate them, and the variable expression of NAS in different states are crucial. Infants who have recognizable difficulties in state control should be evaluated for their ability to transition through states in a comfortable environment with minimal, manageable stimuli (low lights, minimal sound, touch and movement) with the goal of helping them to achieve quiet alert or restful sleep. Parents need to be encouraged to respect sleep, and to wake a newborn who is in a sleep state only if feeding is needed, emphasizing the important role of sleep in brain development.[51] At the same time it is equally important to determine and provide only the amount of stimuli tolerable to the infant, with the goal of achieving a quiet alert state. Slow arousal, keeping the environment minimally stimulating, and using gentle handling before the time of feeding, bathing or changing (or preparing the infant for any interaction), may help the infant to achieve improved regulation between states. Infants with difficulties in eye-to-eye contact because of overstimulation may be at risk for being poorly related to their mothers. These infants require a sensitive caregiver who understands that a rested infant better tolerates interaction, and accordingly adjusts the environment to the infant and avoids any intrusive behaviors. A pacifier, gentle and slow vertical rocking, and containing the arms can facilitate eye contact and interaction. Some infants can be very sensitive to brightly colored objects. The use of black and white objects or determining which colors or visual stimuli are comfortable may prevent overstimulation and facilitate attention and better control of neck and head movements while focusing on and tracking objects or faces.

Motor and Tone Control

Treatment of motor and tone dysregulation, such as tremors or disorganized motor movements and hypertonicity, includes gentle handling and containment, positioning, nonnutritive sucking and swaddling (with careful observation of infant temperature). First, the caregiver can put the baby on his side or back, hold his hands (frequently the infant grasps the handler's thumbs) and bring them toward the baby's chest. If the newborn is on his side, the head and hips can be brought forward, simulating the fetal position (Fig. 4). In addition, very gentle pressure can be applied to the head, and or trunk or the head rubbed gently. When holding, the provision of gentle pressure to the posterior head bringing the head forward will help if tolerated. Slow vertical rocking can be used to help with relaxation in some infants. Hyperthermic infants may not be able to be swaddled, and in these infants, a folded blanket across the chest to contain the arms may be beneficial. Fisting, back arching, jaw clenching, and/or head thrashing may be interpreted by the mother as the infant's dislike of being held. This misinterpretation can be changed by a provider that models and demonstrates techniques that relax the infant's tone and decrease the uncoordinated movements. It can be a rewarding experience for the mother to feel the calm and sense of wellbeing of a cuddled, properly positioned and contained baby. Knowing that her techniques can move the baby from a hypertonic, disorganized, irritable state to a quiet alert or sleep state can increase her self confidence. Pacifiers are very useful, in general, because rhythmic, nonnutritive sucking behavior has a soothing and state-organizing effect on most newborns and helps to modulate and decrease infant uncoordinated movements and distress.[52] However, caregivers need to be aware that infants who do not have good control of movement may vigorously turn their heads side to side (head thrashing, or exaggerated rooting) when the pacifier or nipple is brought close to the mouth, suggesting that the baby does not want them. Helping the baby to keep his head still will facilitate the insertion of the pacifier or breast nipple to the mouth. Motor difficulties such as hypertonia and tremors may produce excoriations over pressure points. Excoriations of knees and elbows may occur because of excessive movements of extremities. Attempts to get hands to mouth to self-soothe may be difficult for hypertonic and jittery infants and result in scratching of the face or body. Mittens, frequent holding, swaddling, and pacifiers may help these infants.

For infants with feeding difficulties because of motor and or tone regulation, small and frequent feeds of high-calorie formula (to compensate for excessive caloric expenditures), frequent burping, and evaluating signs of stress at

frequent intervals may help, with interruption of the feed if the infant is growing tired, needs to reposition or requires self-organization or assistance with organization. Rubbing the back instead of patting (which may repeatedly set off a hyperactive Moro reflex in some infants) during burping can decrease overstimulation in hypersentive newborns. Some infants may need the pacifier during pauses to burp if they become very irritable when the bottle is removed from the mouth.

Autonomic Signs of Stress

An environment that bombards the newborn with a level of information that cannot be processed effectively can overwhelm the infant's autonomic functioning and produce stress responses that potentiate the expression of NAS.

As soon as a sign of stress is detected (eg, hiccups, color change, bowel sound) the interaction with the infant should be modified to stop the sign and prevent further homeostatic dysregulation (spitting up, gagging, bowel movement) because of external demands. Infants exhibiting pull down are frequently under recognized and under treated, and they often display poor feeding and failure to thrive. Careful observation for signs of stress such as color changes, bowel sounds, sneezing, back arching, particularly in response to stimulation, should provide some cues to handlers that the infant is awake and not in a sleep state as he may appear to be. Caregivers need to avoid vigorous stimulation, which is the natural inclination of a care provider to arouse and feed the infant. These infants should receive small and frequent feedings with gentle handling, and the environment should be minimally stimulating. Lack of autonomic regulation has been found to serve as a critical indicator of negative infant behavioral cues and decreased maternal responsiveness.[53] An under- or overstimulating environment for a dysregulated infant can impair movement toward more complex and integrated responses that facilitate the development of the cognitive, social, emotional and motor functions. Health care providers can point out how to recognize signs of stress, what triggers exist for the stress responses observed in the infant, and what to do to prevent or ameliorate them.

CONCLUSIONS

Nonpharmacologic management should be employed for every opiate exposed infant from the time of birth. The goal of nonpharmacologic intervention is to support the neuromaturation and self-organization of the infant, and it should be instituted and continued with infants displaying NAS regardless of their need for medication therapy. Nonpharmacologic treatment of NAS should not be used as a substitute for opiate replacement medication for infants that require such. It is well accepted that stable, sensitive and attuned caretakers affect the infant's regulatory capacity and his ability to establish meaningful relationships.[54,55] Challenging behaviors such as irritability, uncoordinated movements, dysregulated sleep-awake patterns, hypertonicity, and autonomic signs of stress, frequently displayed by an infant undergoing NAS, can initiate altered caregiver behaviors, which have been considered an additional teratogenic effect of the prenatal substance exposure.[31] The modification of NAS expression in affected infants and the infant's recovery depend on the care provider's ability to correctly interpret the infant's abilities and difficulties, the provision of individualized comforting techniques, and the avoidance of intrusive interactional strategies often used to elicit social behaviors in the newborn. Multiple factors affect the mother's emotional and physical availability to help regulate and organize her newborn exhibiting NAS. Maternal substance abuse, mood disorders, and adverse childhood experiences may influence maternal responses to the newborn cues.[33–35,56] It is the role of the health care provider to properly assess and interpret the infant's behaviors, determine how the mother understands and responds to her infant, and to tailor interventions to help the mother provide a sense of wellbeing and organization to the infant and a sense of confidence in her parenting abilities. This in turn may improve the infant's short, and possibly long-term developmental, behavioral, and interactional outcomes.[57]

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