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Pairing Best Practices to Reduce Length of Stay with Neonatal Abstinence Syndrome: The Finnegan Scoring Tool and Cue-Based Feedings

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Abstract

Background: Neonatal abstinence syndrome (NAS) is the combination of physiologic and neurobehavioral withdrawal symptoms exhibited by infants following the abrupt halt of intrauterine exposure to addictive drugs at the time of delivery. The Finnegan Scoring Tool (FST) is a clinical assessment tool used to determine the severity of withdrawal. Scores generated by the FST are used to regulate opioid therapy. An infant's duration of drug therapy and hospital length of stay is directly correlated to accurate and consistent administration of the FST in association with stringent weaning protocols.

Purpose: The purpose of this paper is to propose best practice recommendations for the administration of the FST respective to infant feeding schedules.

Findings: Research suggests that evidence-based clinical practice guideline (CPG) supported by proper application of the FST and rigid adherence to weaning protocols is of paramount importance for the successful treatment of NAS. A thorough review of the literature revealed no evidence for best practice regarding the timing of FST scoring of infants relative to their feeding schedules.

Implication for Practice: Developing guidelines for feeding based administration of the FST, may facilitate NAS treatment and decrease hospital length of stay and healthcare costs.

Implications for Research: Further investigation is needed to evaluate CPGs and launch quality initiatives focused upon quality, safety and costs associated with inpatient management of NAS.

Keywords: Neonatal Abstinence Syndrome; Opioids; Finnegan Scoring Tool

Introduction

Intrauterine exposure to maternally ingested licit or illicit drugs place a newborn at risk for neonatal abstinence syndrome (NAS). NAS is a combination of physiologic and neurobehavioral symptoms displayed by infants following the abrupt withdrawal of drug exposure at the time of birth. While cocaine and other stimulants, benzodiazepines and selective serotonin reuptake inhibitors (SSRIs) have been implicated, NAS most commonly occurs in the context of ante partum opioid use [1,2]. The gastrointestinal, respiratory, autonomic and central nervous systems are affected as well as critical regulatory centers of postnatal adaptation [3]. Infants with NAS often endure prolonged hospitalizations of five or more days and frequently require treatment with opioids.

Scoring the severity of NAS is most often completed using the Finnegan Scoring Tool (FST). This tool aids clinicians in determining if non-pharmacologic interventions are sufficient to mitigate the effects of opioid withdrawal or if pharmacologic adjuncts are necessary to ensure the safest wean from opioid addiction. Nutritive feeds, a non-pharmacologic treatment used with all neonates capable of ingesting enteral nutrition, are administered an average of six to eight times daily. This interval closely mimics the recommended interval for scoring and evaluating the severity withdrawal. The FST is widely regarded as the best practice for evaluating severity of withdrawal. Nutritive feeds are widely regarded as the gold standard for neonatal nutrition. Despite this, they have not been considered as a synergistic best practice for evaluating neonatal withdrawal. Therefore, the purpose of this manuscript is to review the evidence and discuss the benefits of pairing of developmentally appropriate nutritive feedings with NAS scoring for evaluating the severity of NAS.

Epidemiology

More than 116 million Americans, including pregnant females, report chronic pain and receive opioids as a pharamcologic treatment, a practice that is costing the healthcare system an estimated $560 to $635 billion dollars per year [4,5]. The incidences of prescription writing and dispensing of controlled substances are reported to be 400% greater now than 10 years ago in some states, which directly correlates with the concurrent rise in opioid abuse and infants born addicted to Schedule II controlled substances [2,6-8]. According to the CDC, in 2010 alone, enough opioids were prescribed to medicate every American adult with 5 mg of hydrocodone every 4 hours for 30 consecutive days [2,7].

Antepartum opioid use more than quadrupled in the United States between 2000 and 2009 and the incidence continues to rise [9]. The 2009 National Survey on Drug Use and Health reported that 4.4% of pregnant women ages 15 to 44 admitted to recent illicit drug use and this percentage is likely an underestimation of true rates due to maternal under-reporting [1,10].

Approximately 50 to 95 percent of infants born to drug addicted women will develop NAS and in 2012, nearly one baby each hour was born addicted to licit or illicit substances [2,11].

Cost and Burden to Healthcare

Annually 800,000 to 1 million infants are born to women who use drugs during pregnancy and fifty to 95% of those exposed to opiods will develop NAS [11,12]. Depending on the severity of withdrawal, the duration of NAS treatment ranges from 6 days to 8 weeks [13]. The average length of hospitalization in 2009 totaled 16.4 days as compared to the typical 48-72 hour LOS for a healthy neonate [2]. The management of NAS is complex, requires specialized nursing and medical care and predominantly occurs within costly neonatal intensive care units (NICUs) rather than newborn nurseries. In 2009, an estimated $720 million healthcare dollar were spent caring for infants with NAS and much of that expense was assumed by state Medicaid programs [2].

Implications for Infants

Maternal drug abuse is associated with poverty, decreased health care utilization, mental illness, poor nutrition and exposure to violence [12]. The lack of a supportive environment is associated with negative pregnancy outcomes such as prematurity and low birth weight. Infants with NAS have increased morbidity including poor weight gain, respiratory problems, feeding difficulties and seizures [2]. The protracted length of stay (LOS) for NAS prolongs maternal-infant separation, stresses the already fragile dyad, and predisposes into dysfunctional bonding. These infants are frequently exposed to ongoing, postnatal maternal drug use and maladaptive parenting practices [14]. The intelligence of children with prenatal exposure to drugs appears to be affected by the quality of caregiver interactions and there are studies to suggest long-term difficulties related to behavior, cognition, language and achievement in infants with NAS [15,16].

NAS Management

The problem of prenatal opioid exposure and subsequent addiction in infants has been recognized in all levels of society since the 1950's [17]. The expression of NAS is multi-factorial and highly variable in the type and intensity of symptoms [18]. Additionally, the picture of NAS is rapidly evolving ahead of research as different illicit drugs come into vogue and new classes of drugs, such as SSRIs, are developed and introduced into obstetrics. Despite concern and decades of study, there remains a knowledge-practice gap specific to the treatment of NAS. Even with significant healthcare and social motivations, a paucity of strong evidence for a comprehensive, standardized best practice for the evaluation and treatment of NAS lingers and current treatment strategies have been unable to decrease the LOS for these infants over the past decade.

Evaluation of NAS using the Finnegan Scoring Tool (FST)

In 2012, the American Academy of Pediatrics (AAP) released a statement recommending the use of a standardized evaluation to assess and guide the management of NAS [1]. The FST is a clinical assessment tool used to determine the severity of withdrawal symptoms exhibited by infants with prenatal opioid exposure [19]. The AAP acknowledges the FST as the gold standard for assessing the severity of neonatal withdrawal and it is the most widely used tool in the United States [1,20]. Scores generated by the FST are used to determine if non-pharmacologic treatments alone are sufficient to manage NAS or to initiate, modulate and wean pharmacologic therapy. An infant's duration of therapy and hospital LOS is primarily dependent upon accurate and consistent use of the FST.

Despite its popularity, the FST is challenging to use. It is fraught with subjectivism due to definitions that may be ambiguous to users and frequently suffers from low inter-observer reliability [21]. It is common for items on the tool to be defined and interpreted differently by independent observers. Lucas and Knobel [11] report that without adequate training and education, the tool is applied inconsistently. Incorrect administration and poor inter-observer reliability of the FST leads to protracted weaning, prolonged infant exposure to treatment with opioids and a delay in discharge [9,21,22].

Treatment

Nursing assessment and evaluation of the at-risk infant is the foundation that drives decisions related to management and treatment of NAS. Treatment is initiated based upon FST scores generated by nurses who observe and provide care to the withdrawing infant. Management may be non-pharmacologic or pharmacologic in nature. Non-pharmacologic measures such as swaddling, nutritive suckling or skin-to-skin care should be the first choice in all cases as they are easily acceptable, less expensive, less controversial and are associated with shorter LOS [23]. Non-pharmacologic interventions, initiated by the bedside nurse and family, are directed at encouraging optimal nutrition and minimizing external stimuli. Supplying a quiet and darkened environment with developmentally structured care is crucial. Gentle handling and swaddling with positioning lessens auto-stimulation, decreases crying and promotes more sustained sleep [24]. Care should be taken to not disturb the infant's natural sleep-wake cycle [23]. Infants with NAS frequently struggle with poor weight gain due to dysfunctional feeding and increased caloric expenditures due to interrupted sleep intervals and excessive activity. A principle goal of therapy is to conserve energy; sustaining the infant in a relaxed and calm disposition promotes successful feeds and consistent weight gain. Kocherlakota [23] expresses the importance of staying alert to early signs of irritability and intervening with comfort measures to soothe the infant in order to break the cycle of irritability, excessive crying, poor feeding and sleep loss.

Cue-based feeding is an infant driven model that allows feeds to be tailored to an infant's developmental needs with a focus on quality [25]. Feeds are offered in response to the infant's cues and end when the infant displays satiety [26]. Cue based feeding offers an individualized approach to feeding that respects the distinct and changing needs of an infant, minimizes stress and is a key component of successful feedings [27]. Feeding cues are a means for infants to interact with care-givers; reinforcing trust and bonding and providing comfort.

Withdrawal resistant to non-pharmacologic measures, such as cue-based feedings and a quiet environment, require pharmacologic treatment. The initiation of pharmacologic treatment exponentially increases LOS and often imposes the separation of the mother-infant dyad; placing increased demands on the inter professional healthcare team [28,29]. Therefore, accurate and consistent use of the FST is essential to avoid unnecessary initiation of pharmacologic therapy and resultant slow weaning and increased LOS.

Bedside nurses primarily administer and generate the FST scores upon which management and treatment decisions are made. This nurse-driven process is dependent upon accurate scores. The FST is designed to be dynamic, meaning the score should incorporate all the symptoms of withdrawal that occur during a 3-4 hours interval rather than those present at a single instance [21].

Unfortunately, clinician soften prescribe every 3 to 4 hours FST scoring intervals and bedside nurses complete the FST scoring prior to offering nutritive feedings. The administration of the FST in this manor does not facilitate adaption to the infant's individual needs and is not evidence-based [30]. This practice undermines infants' natural sleep-wakes cycles as well as negates the considerable benefits of adequate rest and cue-

based feeds and thus the opportunity to avoid pharmacologic treatment altogether. In order to advance NAS care, there is a need for an evidence-based and pragmatic approach to use of the FST that incorporates individualized infant feeding schedules.

Kolcaba's Comfort Theory and NAS

According to Katharine Kolcaba's Comfort Theory [31], comfort is an immediate and desirable outcome of nursing care. Nursing is defined as the process of evaluating a patient's comfort needs, implementing nursing interventions and then assessing the patient's comfort following the interventions. Kolcaba [31] states that nursing interventions are successful if an increased level of comfort is achieved for a patient as compared to a previous baseline. The Comfort Theory supports best practices that furnish the means to define the outcome of patient comfort, reduce the symptoms of NAS and shorten hospital LOS.

It is appropriate for best practices to be developed within a theoretical framework to facilitate the analysis and interpretation of derived data. Operationalizing nursing theory as a means to underpin clinical practices is meaningful and relevant. This places priority upon the thoughtful, comprehensive and evidence-based approach that is requisite when critically appraising data in an attempt to advance nursing practice [32]. Furthermore, nursing theory is necessary for the advancement of nursing as a profession.

Infants with NAS are provided comfort by the non-pharmacologic nursing intervention of feeding. The current mainstay of NAS management and treatment involves predetermined, inflexible 3-4 hour intervals for nursing assessment and NAS scoring with the FST. Nurse driven interventions are taken to manage discomfort and the infant is monitored for relief. The goal of treatment is to lessen the degree of discomfort and symptoms as evidenced by stable or decreasing FST scores overtime. The incorporation of the FST with cue based feedings as a comfort measure in infants with NAS may result in lower FST scores, provide optimal management with less opioid exposure, and reduce LOS [22].

Considerations for Practice and Research

Inconsistencies in the execution of symptom management will prohibit evidence-based care for infants with NAS [20]. A large 2014 Ohio study demonstrated that the use of standardized treatment protocols, linked to stringent weaning guidelines, reduces the duration of opioid exposure and LOS [22]. To optimize high quality care delivery, clinical practice guidelines (CPG) for the application of the FST by nursing personnel must be developed and implemented [30]. This will serve to elaborate on already pre-existing CPGs focused primarily on the identification and treatment of NAS. CPGs should be evidence-informed, infused with education on FST administration, include nursing specific methods addressing the individual and developmental feeding needs of infants and incorporate Finnegan scoring with cue-based feeds.

In order to develop evidence-based CPGs, focused research on the outcomes of pairing of the FST with cue-based feedings must occur and be disseminated in the literature. The majority of published research on feedings for infants with NAS examines the content of feeds with an emphasis on promoting breastfeeding as best practice [33-35]. There is a paucity of literature addressing the administration of the FST in conjunction with non-pharmacologic cue-based enteral nutritive feeds. As a result, treatment protocols predominately disregard individual infant feeding schedules and lump NAS neonates with other new admits that require a standardized every 3 to 4 hour feeding schedule. This forfeits the notable benefits of cue-based feeds for a population that does not necessarily require highly regimented feeding regimens. No studies have been performed examining outcomes of the integration of FST administration with ad lib, cue-based feedings and its effect on scoring, treatment needs and LOS. There is no defined best practice regarding the timing of feeds for infants with NAS, yet identifying answers to this timely issue could impose significant quality and safety benefits upon the neonate, family and healthcare system (Table 1).

Conclusion

Neonatal abstinence syndrome is a growing epidemic with notable social and economic costs. Management is demanding with complexities

1.	Does the provision of cue-based feedings for infants with NAS promote decreased NAS symptoms and result in lower FST scores?
2.	Will FST scoring in conjunction with cue-based feeds result in a reduced incidence of pharmacologic therapy for infants with NAS?
3.	Will FST scoring in conjunction with cue-based feeds result in decreased hospital LOS?
Summary of Recommendations	
What we know:	• NAS is an epidemic with no widely recognized standard of practice proven to facilitate decreased LOS • Inconsistent clinical practices and deviations from known best practices decrease quality of care and increase LOS • Increased LOS secondary to NAS promotes the separation of the mother-infant dyad, impairs bonding and adaptation
What needs to be studied:	• Outcomes (sleep-wake cycles, linear growth trajectory, LOS) of FST scoring combined with the provision of cue-based nutritive feeds • Implications of cue-based feeding as a standard of practice with NAS on interprofessional caregiver burden • Interval for refresher training for bedside caregivers administering the FST to ensure continuing competency and accuracy in scoring
What can we do today:	• Develop and implement evidence-based protocols for the identification, evaluation and treatment of NAS • Imbed inter-rater reliability methodology for the Finnegan Scoring Tool into each nursery that evaluates and treats NAS • Role-model best practices to empower and encourage parents to consistently and effectively provide developmentally appropriate non-pharmacologic care to their neonate with NAS

Table 1: Future Research Considerations for Nursing Professionals and Inter professional Quality Improvement Teams

that lie within multi-factorial causes and a paucity of evidence-based treatment measures. Significant variability lies within the evaluation and management of NAS, which deters evidence-based practice, leads to suboptimal therapy and may prolong hospital LOS. The need for research to support best practice surrounding infant feedings is evident. Research should guide the development of an evidence-based, nursing specific, practice guideline for administering the FST that addresses the individualized feeding needs of infants with NAS.

Conflicts of Interest

All authors (primary and co-authors) have read and approved this article for submission as well as contributed to the substance of the work. There are no conflicts of interest to disclose. No author has any commercial interests in the subject of this article, and no financial or material support was provided to the authors in the form of grants, medications, equipment, or any other sources.

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