Neonatal Abstinence Syndrome: Kentucky Children's Hospital's Experience with Outcome Measures and Disposition

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Introduction

Kentucky is at the heart of the United States opioid abuse epidemic. Neonatal Abstinence Syndrome (NAS) is a withdrawal syndrome occurring in neonates with in utero exposure to drugs, most commonly to opioids (prescribed and illicit). It has also been described with barbituates, buprenorphine, and stimulants (such as cocaine). (1) Symptoms of this syndrome include central nervous system irritability, hypersensitive autonomic nervous system, as well as gastrointestinal irritability. (1,2)

According to the CDC, in the United States the overall incidence of NAS has increased by 400% from 2000 to 2012. (3,4) There are significant health as well as social repercussions for the infants and mothers who are a part of this trend. Additionally, there are significant societal financial implications. According to one report, in 2012, an uncomplicated course for a term infant could anticipate a mean length of stay of 2.1 days and charge of $3,500; contrastingly an infant with NAS had an average hospital stay of 16.9 days and charge of $66,700. (4)

At Kentucky Children’s Hospital, we designed this study to not only examine our own institution’s experience with NAS, but its impact on outcomes and disposition as well.

Hypothesis

There is no difference in NAS symptoms, outcomes, treatment, or disposition among neonates born to mothers with substance abuse history.

Methods

Retrospective analysis was completed of a single institution database after obtaining IRB approval. Eligible patients were all neonates admitted to the Neonatal Intensive Care Unit at Kentucky Children’s Hospital over two six month periods five years apart (January 1, 2011 - June 30,
2011 and January 1, 2016 - June 30, 2016) with a diagnosis of NAS. For this post-hoc analysis we included only patients with the diagnosis of NAS in whom we had data regarding factors of interest.

Statistical analysis was completed using standard methods. For samples regarding comparison of means, a pooled t test was completed. A two sample proportion v test was completed for data involving sample proportions. Relative risk ratio was calculated for statistically significant factors of interest.

Results

163 patients met our inclusion criteria with the diagnosis of NAS. Of these patients, 51 were accrued during the 2011 period and 112 were accrued during the 2016 period. We noted an increase in neonates being placed on mechanical ventilation at any point in their stay from 23.5% to 34% from the 2011 to the 2016 group. There were also numerous changes in the substances used. In 2011, opioids were the most common substance used (72.5%). This transitions to suboxone being the most common in 2016 (66%). Heroin exposure has gone from 0% in the 2011 patient subgroup to 18.8% in the 2016 patient subgroup. Comparing data from 2016 to 2011 data, there has also been a trend in neonate placement toward release to non-parental relative guardianship (32% vs 26%) in recent years. This has been accompanied by a decreased percentage of neonates being placed in foster homes (15.6 % in 2016 from 28 % in 2011).

On assessing data from our patient population as a whole, we had several interesting findings. Maternal SSRI is indicative of a neonatal APGAR <8 at 0 minutes (p=0.0078) and 5 minutes (p=0.05516). Maternal methadone use is predictive of a 0 minute (p=0.027394) and approaches predictive value of a 5 minute APGAR ≥8 (p=0.052622). No other maternal substance use significantly predicted neonatal APGAR scores at 0 minute or 5 minutes.

Maternal methadone use was found to be less likely associated with neonatal respiratory distress (p=0.0398). Additionally, patients with in utero exposure to methadone were less likely to require mechanical ventilation at any point in their hospital stay compared to those with other drug exposures (p=0.042179).

Maternal suboxone use predicts neonatal treatment with morphine (p=0.0002). Both maternal benzodiazepam (p=0.007362) use and maternal SSRI use (p<0.0001) predict neonatal treatment with phenobarbital. Maternal SSRI use (p=0.0386), ethanol use (p=0.003053) and maternal methamphetamines (p=0.031777) use each predict neonatal treatment with clonidine.

Maternal opioid use was predictive of an increased incidence of neonatal mechanical ventilation at 24 hours (p=0.0399). Maternal SSRI use was attributed with an increased treatment of neonates with nasogastric tube feeds when compared to other substances used (p=0.000946).
Maternal opioid (p=0.0303), marijuana (p=0.00924), cocaine (p<0.0001), methadone (p=0.007751), and heroin (p=0.002098) use were each predictive of release of neonate to non-parental guardianship.

Conclusions

Neonates exposed to methadone in utero had improved neonatal APGAR scores compared to other in utero drug exposures versus infants exposed to SSRIs who had significantly lower APGAR scores. Infants with suboxone exposure also had decreased incidence of respiratory distress and decreased requirement of mechanical ventilation at any point during their hospitalization. SSRI exposure is associated with increased incidence of NG feedings. Most infants discharged with NAS at our institution are released to non-parental guardianship. The trend in 2011 was for release to a non-relative foster family. In 2016, release to a non-parental relative is more common.

References:


