Examination of an Outpatient Approach to the Treatment of Neonatal Abstinence Syndrome

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**Background:** Neonatal Abstinence Syndrome (NAS) is a pattern of symptoms and behaviors exhibited by neonates who have been exposed to licit and illicit substances in utero. NAS has become an epidemic within the last several decades. According to research an infant is born addicted to opiates every hour. Furthermore, healthcare costs associated with NAS are estimated to be $112.6 million annually. Much of this cost is due to the substantial length of stay required to wean infants from pharmacological treatment so they can be discharged home to their families. This is accomplished in the traditional inpatient setting. A more innovative and cost-effective approach to the treatment of NAS may be to establish outpatient treatment clinics.

**Aims:** Our primary aim was to decrease the length of stay (LOS) for infants diagnosed with neonatal abstinence syndrome from a mean of 35 days to a mean of 17 days (greater than 50%) between December 2009 and June 2011, and to continue to decrease length of stay annually to the present rate of 11.1 days as of June, 2015. Secondary aims included increased family and nurse satisfaction and decreased costs associated with an NAS diagnosis.

**Setting:** 60-bed Level II/III NICU in a teaching hospital with annual admission volume of 600 infants per year. Approximately 50 infants are admitted to the NICU for treatment of NAS annually. Most infants are discharged home to their families and receive follow-up care in the Outpatient NAS Clinic.

**Mechanisms:** Historically, infants with NAS remained in the hospital, occupying an ICU or PCU bed for the duration of their treatment and were weaned off of medication prior to discharge. It was felt that a better alternative to this treatment modality could be accomplished by having the infants discharged on NAS medication (methadone) and followed-up in an outpatient setting, under careful supervision of the physician and supported by social work. Drivers for this change were identified as length of stay, increasing family satisfaction by supporting the mother-infant dyad in the home environment, nurse satisfaction, and decreasing costs.

**Methods:** We developed a protocol that helped to standardize treatment across providers. We implemented nursing staff education of the modified Finnegan tool and incorporated inter-rater reliability training. We developed a parent education pamphlet that described what NAS is, the treatment process, and what to expect during the infant’s hospitalization and follow-up care. We established a physician-led outpatient NAS clinic, which provided support for families while allowing infants to be home instead of remaining in the hospital. We participated in a large-scale, multi-center, multi-state VON NAS Quality Improvement Collaborative.
**Measures:** All measures were acquired in real-time and through retrospective chart review. Cases were presented at monthly NAS committee meetings. Updates regarding progress in the clinic along with practice modifications were provided by the clinic physician.

- Primary: LOS in days
- Secondary:
  - Costs in dollars
  - Family satisfaction scores using Professional Research Consultants data

**Data/Results:** The development of a standardized protocol and the opening of an outpatient NAS clinic resulted in a significant reduction in LOS for infants with NAS from 35 days to 11.1 days (Figure 1). The financial impact of the outpatient clinic model has resulted in an estimated savings of over $30,000 per infant, with an annual savings of over $1.5 million. This was calculated using a daily Intermediate bed charge of $1265/day and subtracting the cost of hospitalization for 11.1 days (current LOS) from the cost for 35 days (LOS prior to implementation of the clinic). Families of infants with NAS are compliant with the clinic regimen, receive support through social services, and report satisfaction in having their infant home with them instead of in the hospital.

**Discussion:** The traditional inpatient model of care delivery for infants with NAS, who are otherwise healthy, is expensive, consumes valuable resources, and causes increased stress on vulnerable families. Much of this cost is due to the substantial length of stay required to wean infants from pharmacological treatment so they can be discharged home to their families. A more innovative and cost-effective approach to the treatment of NAS may be to establish an outpatient treatment clinic. The outpatient clinic model has been shown to be effective at reducing LOS, associated costs, and increasing family satisfaction.

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Figure 1: Run chart showing decrease in LOS for NAS infants after initiation of the outpatient NAS clinic.