

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

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What is Neonatal Abstinence Syndrome (NAS)?

- Withdrawal syndrome in neonates with in utero exposure to drugs
- Central nervous system irritability, hypersensitive autonomic nervous system, respiratory distress, gastrointestinal irritability.^{1,2}
- Symptom of an epidemic
 - US incidence of NAS increased by 400% from 2000 to 2012.^{3,4}
 - In 2012, uncomplicated peripartum hospital course for:
 - Term neonate: mean stay of 2.1 days and charge of \$3,500.⁴
 - Infant with NAS: mean stay of 16.9 days and charge of \$66,700.⁴

Objective

Examines our institution's experience with NAS, as well as its impact on outcomes and disposition

Methods

- Retrospective analysis of a single institution database with IRB approval
- Eligible patients were neonates admitted to NICU at Kentucky Children's Hospital over two six month periods five years apart with NAS
- Statistical analysis was completed using standard methods including:
 - Pooled t test for comparison of means
 - Two sample proportion z test for data involving sample proportions
 - Relative risk ratio was calculated for statistically significant factors

Results

163 patients (51 accrued in 2011 & 112 accrued in 2016)

Mean length of stay 22.5 days

There were several interesting trends comparing 2011 to 2016 patients (Table 1)

- Decreased mean length of stay
 - Increased incidence of mechanical ventilation
 - Proportion of methadone exposure decreased while suboxone exposure had a near fourfold increase
- Overall, methadone predictive of better Apgar scores (Table 2), decreased incidence of respiratory distress (Table 3), and mechanical ventilation (Table 4)

Year	2011	2016
Total Number of NICU Patients	353	481
Patients with NAS	51	112
Mean Length of Stay (Days)	28.86	19.69
Mechanical ventilation	23.5% (n=12)	34% (n=112)
Suboxone Exposure	15% (n=8)	66% (n=74)
Methadone Exposure	15% (n=8)	8.9% (n=10)
Heroin Exposure	0% (n=0)	18.8% (n=21)
Foster Care Disposition	28% (n=14)	15.6% (n=17)
Second Degree Relative Disposition	26% (n=13)	32.1% (n=109)

Conclusions

- Better APGAR scores with methadone
- Decreased incidence of respiratory distress and mechanical ventilation with methadone
- Increased proportion of infants with suboxone exposure and decreased methadone proportion over five year period
- Most NAS infants released to non-parental guardianship
- 2011 trend for release to non-relative foster family
- 2016 release to a second degree relative more common

Variable	0 minute Apgar ≥8	5 minute Apgar ≥8
	P value	P value
Barbituates	0.535	0.35
Benzodiazepines	0.23	0.993
Ethanol	0.457	0.756
Methadone*	0.027	0.0526
Methamphetamines	0.93	0.342
SSRI	0.0078 (less likely)	0.055 (less likely)

*risk ratio for: 0 min. Apgar ≥8: 1.42 5 min. Apgar ≥8: 1.2

References

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2. Hudak ML, Tan RC; Committee on Drugs; Committee on Fetus and Newborn; American Academy of Pediatrics. Neonatal drug withdrawal. *Pediatrics* 2012;129:e540–560
3. Ko JY, Patrick SW, Tong VT, Patel R, Lind JN, Barfield WD. Incidence of neonatal abstinence syndrome—28 States, 1999–2013. *MMWR Morb Mortal Wkly Rep* 2016;65:799–802
4. Patrick SW, Davis MM, Lehmann CU, Cooper WO. Increasing incidence and geographic distribution of neonatal abstinence syndrome: United States 2009 to 2012. *J Perinatol* 2015;35:650–655

Variable	P value	Risk ratio
Benzodiazepines	0.0967	
Ethanol	0.0633	
Methadone	0.0398	0.315
SSRI	0.0662	

Variable	P Value	Risk Ratio
Benzodiazepines	0.816	
Methadone	0.042	0.20139