Neurodevelopmental Outcomes for Infants with Neonatal Abstinence Syndrome

Implications for Speech-Language Pathologists and Audiologists

Kerry Proctor-Williams, Ph.D, CCC-SLP
Dept. of Audiology & Speech-Language Pathology East Tennessee State University
What’s Happening in Your Community?
Drug Dependent Newborns (Neonatal Abstinence Syndrome) Surveillance Summary For the Week of September 15-21, 2013 (Week 38)¹

Reporting Summary (Year-to-date)
Cases Reported: 601
- Male: 348
- Female: 253
Unique Hospitals Reporting: 48

<table>
<thead>
<tr>
<th>Maternal County of Residence (By Health Department Region)</th>
<th># Cases</th>
<th>% Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Davidson</td>
<td>31</td>
<td>5.2%</td>
</tr>
<tr>
<td>East</td>
<td>158</td>
<td>26.3%</td>
</tr>
<tr>
<td>Hamilton</td>
<td>11</td>
<td>1.8%</td>
</tr>
<tr>
<td>Jackson/Madison</td>
<td>1</td>
<td>0.2%</td>
</tr>
<tr>
<td>Knox</td>
<td>66</td>
<td>11.0%</td>
</tr>
<tr>
<td>Mid-Cumberland</td>
<td>42</td>
<td>7.0%</td>
</tr>
<tr>
<td>North East</td>
<td>93</td>
<td>15.5%</td>
</tr>
<tr>
<td>Shelby</td>
<td>11</td>
<td>1.8%</td>
</tr>
<tr>
<td>South Central</td>
<td>20</td>
<td>3.3%</td>
</tr>
<tr>
<td>South East</td>
<td>10</td>
<td>1.7%</td>
</tr>
<tr>
<td>Sullivan</td>
<td>62</td>
<td>10.3%</td>
</tr>
<tr>
<td>Upper Cumberland</td>
<td>77</td>
<td>12.8%</td>
</tr>
<tr>
<td>West</td>
<td>19</td>
<td>3.2%</td>
</tr>
<tr>
<td>Total</td>
<td>601</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source of Maternal Substance (if known)²

<table>
<thead>
<tr>
<th>Source of Maternal Substance</th>
<th># Cases</th>
<th>% Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervised replacement therapy</td>
<td>266</td>
<td>44.3%</td>
</tr>
<tr>
<td>Supervised pain therapy</td>
<td>130</td>
<td>21.6%</td>
</tr>
<tr>
<td>Therapy for psychiatric or neurological condition</td>
<td>47</td>
<td>7.8%</td>
</tr>
<tr>
<td>Prescription substance obtained WITHOUT a prescription</td>
<td>232</td>
<td>38.6%</td>
</tr>
<tr>
<td>Non-prescription substance</td>
<td>169</td>
<td>26.1%</td>
</tr>
<tr>
<td>No known exposure but clinical signs consistent with NAS</td>
<td>11</td>
<td>1.8%</td>
</tr>
<tr>
<td>No response</td>
<td>14</td>
<td>2.3%</td>
</tr>
</tbody>
</table>

Cumulative Cases NAS Reported

- 2013 Cases
- Estimated 2011

Week 1 to 39
Substance Use, Misuse & Abuse

Mothers’ Choices
<table>
<thead>
<tr>
<th>DRUGS</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methadone</td>
<td>Treatment of opioid addiction</td>
</tr>
<tr>
<td>Buprenorphine</td>
<td></td>
</tr>
<tr>
<td>Subutex</td>
<td></td>
</tr>
<tr>
<td>Suboxone</td>
<td></td>
</tr>
<tr>
<td>Buprenorphine / Naloxone</td>
<td></td>
</tr>
</tbody>
</table>
Non-prescribed Prescription Drug Use (38.6%)
Non-prescription Substance Use (28.1%)

**DRUGS**

- Heroin
- Cocaine*
- Crack Cocaine*
- Opium
- Methamphetamine

- Hallucinogens
  - LSD, mescaline, psilocybin, PCP*
- Alcohol*
- Marijuana
- Tobacco (nicotine)*
 Supervised Pain Therapy (21.6%)

**DRUGS**

- Codeine
- Fentanyl
  - Duragesic, Fentora
- Hydrocodone
  - Lorcet, Lortab, Vicodin
- Hydromorphone
  - Dilaudid
- Meperidine
  - Demerol
- Oxycodone
  - OxyContin, Percocet, Roxicodone
Supervised Therapy for Psychiatric/Neurological Condition (7.8%)

DRUGS

❖ Benzodiazepines
  o Xanax, Clonipin, Valium Librium, Ativan

❖ Selective Serotonin Re-uptake Inhibitors (SSRIs)

❖ Amphetamines
  o Dexedrine, Adderall

❖ Methylphenidate
  o Ritalin, Concerta

❖ Anticonvulsants
  o Tegretol, Dilantin, Phenobarbitol, Keppra,

PURPOSES

❖ Anxiety, insomnia, agitation, seizures

❖ Depression, anxiety

❖ ADHD, narcolepsy, obesity

❖ Prevention of seizures
Babies with NAS in Withdrawal

http://www.youtube.com/watch?v=6YMDBZj7_0o
Finnegan Neonatal Abstinence Scoring System

Central Nervous System Disturbances
- Duration of high-pitched cry
- Length of sleep following feeding
- Hyperactive Moro reflex – reaction to sudden loss of support
- Tremors
- Increased muscle tone
- Excoriation (skin abrasion) especially knees, elbows, toes & face from hyperactivity
- Myoclonic jerks of limbs
- Convulsions/seizures
Finnegan Neonatal Abstinence Scoring System

Metabolic/Vasomotor/Respiratory Disturbances

- Sweating
- Hyperthermia
- Frequent yawning
- Mottling
- Nasal stuffiness
- Sneezing
- Nasal Flaring
- Increased respiratory rate with or without retractions
**Finnegan Neonatal Abstinence Scoring System**

- **Gastrointestinal Disturbances**
  - Excessive sucking
  - Infrequent/uncoordinated suck
  - Reflux or vomiting
  - Loose/watery stools

- **Scoring**
  - Each behavior observed receives a designated number of points
  - Scored 30-60 min following a feed
  - Scored every 2-4 hours within 24 hours depending on severity of symptoms
  - Scores of $\geq 8$, or $\geq 24$ across 3 consecutive administrations indicate pharmacological therapy (morphine, phenobarbital) is warranted
Samples from the infant’s:
- Hair
- Urine
- Meconium
- Umbilical cord blood

Timing and accuracy of the sample results depends on the half-life of the drug. For example,
- Heroin 30 min
- Cocaine 1 hour
- Morphine 1-7 hours
- Marijuana 4 hours
- OxyContin 3-5 hours
- Methamphetamine 12 hours
Implications for SLPs & Audiologists

ꀂ SLPs
  o Feeding: establishment of coordination of breathe, suck, swallow
  o Facilitating positive interactions and bonding with an irritable infant
  o Parent/caregiver education and counseling

谯 Audiologists
  o It is difficult to obtain reliable test results because of all the artifacts associated with movement
  o Close monitoring of newborn hearing screening outcomes
  o Persistent follow-up until a reliable early hearing screening result is obtained, particularly when
Children’s Neurodevelopmental Outcomes
Fetal Alcohol Syndrome Disorder is the leading identifiable and preventable nonhereditary cause of mental retardation and other birth defects in the US.

Characteristics include:
- facial dysmorphia
- pre- & post-natal growth deficiencies
- central nervous system dysfunction
- general impairment in intelligence
- deficits of attention, memory, learning
- emotional regulation deficits

These deficits contribute to ongoing behavior problems, ADHD, language and learning disabilities and hearing impairment that persist into adulthood.
Increased risk for neurodevelopmental impairment

Identified developmental difficulties include:

- Lower weight, height and head circumference,
- Slower growth, and psychomotor deficits with some studies showing that these persist up to 10 years ...so far.
- Subtle deficits across all or some domains of orientation, habituation, state regulation, autonomic stability, reflexes, tone, motor performance, irritability, alertness and excitability, especially at less than 6 mos.
- Cognitive deficits at 18 and 36 mos and lower social maturity at 36 mos
Identified developmental difficulties include:

- There is growing consensus that prenatal cocaine exposure affects language development and contributes to receptive and expressive language delays, with particular deficits in the use of grammar, complex language and discourse at 3 and 4 years.
- Difficulties in behavior, attention, language and cognition at 4-13 years
- Prolonged ABR absolute and IPLs for infants who had been exposed to cocaine
- Neurodevelopmental compromise of the auditory system appears to result from gestational exposure to cocaine.

Preliminary research of prenatal exposure to methamphetamine is showing similar outcomes.
Use of SSRIs has been linked to subtle motor developmental differences, small head circumference, behavior and social adaptability deficits, maladaptive externalizing behaviors and increased likelihood of autism.

Difficulties associated with Methadone treatment includes motor deficits, reduced social responsivity, and shorter attention spans.

Combined methadone and alcohol exposure predict lower cognitive and language scores.
Children born with NAS demonstrate ongoing neurodevelopmental difficulties beyond the initial perinatal medical symptoms and social fragility.

What we do know are that many of the impaired systems and skills are closely associated with language and auditory processing disorders.

We desperately need to obtain data about this growing population’s long-term outcomes, which are virtually unknown.
Treatment Challenges

Mothers and their Children
Access to the early intervention services can be compromised because of the unavailability of services, failure to qualify, or poor coordination.

In East Tennessee, the rate for those 12 and older who need but do not receive treatment for illicit drug use in at 2.51% exceeds the rates for the state (2.34%) and is equivalent to the national average (2.54%).

The rate for those needing but not receiving treatment of alcohol use at 5.81% is lower than the state (5.93%) and national (6.90%) averages.

Mothers with or recovering from substance abuse are difficult to engage in community health and education services because:

- The complexity of the social and medical problems
- High risk for continued drug use
- Perceptions about social stigma.
It is difficult to isolate the effects of individual drugs because of polysubstance exposure of legal and illicit drugs, alcohol and tobacco.

Environmental risks include:
- Low socioeconomic status,
- Poor prenatal care
- Transience
- Identification of primary caregivers

For some children with NAS, there is a period of illusory developmental competence early on and only later do the social, emotional, behavioral and learning consequences emerge.

Babies may fail to qualify for services or be discharged from services before early detection of problems is observable.
FIGURE 1. Comprehensive prevention and intervention services for substance-abusing mothers and their infants.
References