Assessing Neonatal Abstinence in the Newborn Nursery

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Objectives

• At the conclusion of this session participants will be able to:
  – Understand when and how to use NAS scoring
  – Apply objective assessment criteria to increase the objectivity of the Finnegan Scoring System
  – Apply the Finnegan scoring system in the clinical management of NAS

Neonatal Abstinence Syndrome: NAS

• Withdrawal in the newborn as a result of intrauterine opioid exposure
  – NAS will develop in 55-94% of exposed infants
  – Clinical course varies depending on
    • Opioid of choice
    • Maternal drug history
    • Maternal and infant metabolism
    • Placental metabolism
    • Exposure to other substances

Common Drugs leading to NAS

• Opioid Agonists
  – Morphine
  – Heroin
  – Methadone
  – Oxycodone (Oxycontin, Percocet)
  – Hydromorphone (Dilaudid)
  – Hydrocodone (Vicodin)

• Opioid Agonist/Antagonist
  – Buprenorphine (Subutex)

Clinical Features of NAS

• Neurologic Excitability
  – Tremors
  – Irritability
  – Increased wakefulness
  – High-pitched cry
  – Increased muscle tone
  – Increased reflexes
  – Exaggerated moro reflex
  – Seizures
  – Yawning and sneezing

• Gastrointestinal Dysfunction
  – Poor feeding
  – Uncoordinated and constant sucking
  – Vomiting
  – Diarrhea
  – Dehydration
  – Poor weight gain
  – Autonomic signs
  – Increased sweating
  – Nasal stuffiness
  – Fever
  – Mottling
  – Temperature Instability

Differential Diagnosis

• Never forget to think about other things that can cause NAS-like symptoms in babies:
  – Hypoglycemia
  – Hypocalcemia
  – Hyperthyroidism
  – Intercranial hemorrhage
  – Sepsis
  – Neonatal encephalopathy
  – Metabolic disease
  – Exposure to other drugs – think tobacco and SSRIs
  – Hyperviscosity
Opioid Dependence Epidemiology

- 4.5% of pregnant women 15-44 years old report recent use of illicit drugs
- Heroin use has increased 47% since 2007
- Increased use of prescription opioids – both prescribed and non-medical use
- Infants coded at discharge with neonatal drug withdrawal
  - 1995 = 7653
  - 2008 = 11937

Polydrug Exposure

- Nicotine
  - 90% of opioid-dependent women are heavy smokers
- Alcohol
- Prescription Drugs
  - Oxycodone
  - Hydrocodone
  - SSRIs
  - Other drugs of abuse!

Infants coded at discharge with neonatal drug withdrawal

Maintenance Therapy

- Acute detoxification during pregnancy can lead to fetal distress and fetal loss
- Maintenance therapy is a better choice
  - Diminished illicit opioid use
  - Improved medical health and nutrition
  - More stable environment
- Methadone
- Buprenorphine

Methadone and Buprenorphine

- Onset of withdrawal 24-72 hours
- Onset can occur as late as 1-4 weeks of life!
- Babies withdrawing from buprenorphine may have shorter duration of withdrawal and shorter hospital stays
- Dose and duration of treatment with methadone or buprenorphine likely not linked to severity of NAS

NAS Assessment Tools

- Systematic, objective, periodic and thorough evaluation of the newborn to determine the course of NAS and the need for pharmacologic treatment
- Finnegan Scoring System
  - Modified Finnegan Scoring System
- Lipsitz Scoring System
  - Ostrea Tool
  - Neonatal Withdrawal Inventory
  - Neonatal Withdrawal Narcotic Index

Lipsitz Tool

- Published in 1975
- Recommended in 1998 by the AAP
- Simple to use
  - 11 items
  - Each scored 0-3 on severity
  - Subjective ratings of gross symptoms
- Start pharmacologic therapy at scores > 4

Finnegan Scoring System

- Originally published in 1975 in response to increasing numbers of infants born to narcotic addicted mothers at the Philadelphia General Hospital
- 20 most common symptoms of NAS
- Scored every 1 hour for first 24 hours, every other hour for 2nd 24 hours, every 4 hours after 48 hours
- Inter-rater reliability .82
- Implementing a scoring system
  - Reduced the number of babies treated with opiates
  - Reduced average number of hospital days

Does it work?

- Stable median score of 2 during each of the first 3 days of life in infants known NOT to have been exposed to any opiates in utero
  - 95th percentile 5.5 on dol 1
  - 95th percentile 7 on dol 2

Modified Finnegan Scoring System

- Predominant tool used in the U.S.
- More difficult to use but more comprehensive
  - 21 items
  - Weighted depending on the symptom and the severity
  - Can be subjective
- Start pharmacologic therapy at scores > 8

Who should we score?

- All infants > 35 weeks at risk of NAS!
- Identify risk factors in maternal history
  - Known history of substance abuse
  - Unexplained complications of pregnancy
  - Maternal medical complications
  - Maternal behaviors
- Identify signs and symptoms in infant that suggest NAS

And don’t forget……

- If you are going to start scoring think about
  - Maternal urine toxicology screen
  - Infant urine toxicology screen
  - Meconium toxicology screen
  - More frequent vital signs
  - Infant feeding
  - Other health risks to baby?

Myth: Infants at risk for NAS are always born to young, low SES mothers with a known history of drug use

If you suspect it – score it!
Modified Finnegan Scoring Tool


General Guides to Scoring

• Start scoring around 2 hours of life, then every 3-4 hours
  — Prior to feeding
  — Do not wake infant to score unless scoring interval > 6 hours

• All signs and symptoms observed during a scoring period should be recorded

• Do not score for things that may be associated with feeding or normal infant behavior

• Continue assessment at least 7 days
  — Inpatient or outpatient
  — Sub-acute withdrawal symptoms may last up to 4-6 months

CNS System Disturbances

Continuous High Pitched Cry

• Score 2
  — High pitched cry
    inconsolable > 15 sec OR intermittently for < 5 minutes

• Score 3
  — High pitched cry
    inconsolable > 15 seconds AND intermittently for > 5 minutes

Sleeping

• Use longest single continuous time sleeping since last feeding
  — Score 0
    • Sleeps 3 or more hours continuously
  — Score 1
    • Sleeps < 3 hours after feeding
  — Score 2
    • Sleeps < 2 hours after feeding
  — Score 3
    • Sleeps < 1 hours after feeding
Moro Reflex

- Hyperactive Moro Reflex
  - Arms stay up 3-4 seconds
  - Pronounced jitteriness of hands during or at end of Moro.
  - Jitteriness defined as rhythmic tremors that are symmetric and voluntary
- Markedly Hyperactive Moro Reflex
  - Arms stay up more than 4 seconds
  - Clonus (involuntary repetitive jerks or wrist or ankles)

Tremors

- Tremors = jitteriness
- Involuntary movements or quivers that are rhythmical with equal amplitude or strength which occur at a fixed point
- Observe when baby is both disturbed and undisturbed
  - Undisturbed = tremors with no touch or manipulation
- Score 1: Mild tremors when disturbed
  - Hands or feet only, lasts up to 3 seconds
- Score 2: Moderate or severe tremors when disturbed
  - Arms and legs, lasting more than 3 seconds
- Score 3: Mild tremors when undisturbed
- Score 4: Moderate or severe tremors when undisturbed

Increased Muscle Tone

- While infant is lying supine passively extend and release the infant’s arms and legs to observe for recoil OR
- When infant is supine grasp arms by wrists and gently life infant looking for head lag
- Score 2 when infant is hypertonic
  - No head lag noted or arms or legs won’t straighten

Excoriation

- Holdover from when babies were always placed prone
- Result of constant rubbing of face or extremity against flat surface that is covered with fabric
- Mistakenly thought to describe diaper rash
- Score 1
  - Skin is broken or skin is red but intact or is healing and no longer broken

Myoclonic jerks

- Involuntary spasms or twitching of muscles
  - May resemble myoclonic seizures
  - Different from tremors
- Not included in overall score
- Yes/No response

Seizure

- Automatically score 5 if any seizure activity observed
Metabolic/Vasomotor/Respiratory Disturbances

Sweating
- Look for wetness on infants forehead or upper lip
- Sweating on the back of the neck may be from overheating as a result of environmental influences such as over-bundling
- Score 1 if present

Hyperthermia
- Fever!
- Score 1 if baby has temperature 101.4 F to 101 F (38-38.3C)
- Score 2 if baby has fever > 101 F (38.3C)

Yawning, Mottling, Nasal Stuffiness and Sneezing
- Yawning
  - Score 1 if baby yawns > 3-4 times in a row
- Mottling
  - Score 1 if skin has marbled appearance of pink and pale or white areas
- Nasal Stuffiness
  - Occurs when nares are partly blocked from secretions or exudates. Can also happen with overzealous suctioning
  - Score 1 if any nasal noises with breathing
- Sneezing
  - Score 1 if baby sneezes > 3-4 times in a row

Nasal Flaring
- Dilation of nares with inspiration during breathing
- Can be a sign of respiratory distress
- Score 2 if baby observed to have any nasal flaring

Tachypnea
- Infant must be quieted if crying
- Count respirations for a FULL MINUTE
- Score 1 if respiratory rate >60
- Score 2 if respiratory rate > 60 WITH RETRACTIONS
Gastro-Intestinal Disturbances

Excessive Sucking

- Increased rooting
- Rapid swiping movements of hand across mouth in an attempt to suck on fist, hands or pacifier prior to or after a feeding
- Score 1 if observed

Poor Feeding

- Infant demonstrates excessive sucking prior to a feeding yet sucks infrequently while feeding and takes a small amount of formula or does not sustain an effective suck/swallow at breast
- Demonstrates an uncoordinated sucking reflex
- Continuously gulps formula while eating and stops frequently to breathe
- Unable to close mouth around bottle or breast
- Feedings take > 20 minutes
- Score 2 if poor feeding observed

Vomiting

- Regurgitation
  - Effortless return of gastric or esophageal contents
  - Common in newborns
  - Score 2 if frequent (regurgitates whole feed or regurgitates 2 or more times during feed) not associated with burping
- Projectile Vomiting
  - Forceful ejection of stomach contents
  - Score 3 if this occurs

Loose Stools

- Loose stools
  - Score 2 for loose stools
  - Stool half liquid half solid
  - Watery stool
  - NO WATER RING

- Watery stools
  - Score 3 for watery stools
  - Stool more liquid than solid
  - WATER RING

Further modifications

- Jansson et al
  - Proposed evaluation tool and medication algorithm for NAS treatment
  - Modified Finnegan Scoring Tool
    - Removal of items due to overlap (frantic sucking) and non-responsiveness to medication therapy (mydriasis jerks, mottling)
    - Consolidation of items (regurgitation and projectile vomiting, watery/loose stools, tachypnea and nasal flaring)
    - Addition of items: irritability and failure to thrive
  - Suggested all infants be on continuous CR monitor

Jansson et al. J. Opioid Management 2009; 5(1) 47-55
Now What?

- AAP: optimal threshold score for the institution of pharmacologic therapy using any of the published abstinence assessments is unknown
- Supportive care when scores < 8
- Pharmacologic therapy typically considered when
  - 3 consecutive scores ≥ 8
  - 2 consecutive scores ≥ 12

Supportive Care

- Reduce irritability and promote feeding
  - Tight swaddling
  - Holding and rocking
  - Quiet dark room
  - Limit number of visitors
  - Feeding on demand
    - Small frequent feeds
    - Have pacifier available

Pharmacologic Treatment

- Goals of therapy are to ensure that the infant achieves adequate sleep and nutrition to establish consistent weight gain and begin to integrate into the social environment
  - Prevent complications such as fever, weight loss and seizures
    - Short term amelioration of clinical signs
- No studies have compared the use of different withdrawal score thresholds for initiating drug therapy

AAP Recommendations

- AAP does not recommend specific treatment or weaning regimen
  - Limited available evidence supports use of oral morphine solution and methadone
  - Growing evidence that Clonidine is effective as primary or adjunctive therapy
  - Phenobarbital commonly used as adjunctive therapy
  - Treatment with paragoric is contraindicated
  - Safety of buprenorphine requires more study

General Guidelines for Treatment

- Admit baby to a nursery where they can be monitored during treatment
- Continue scoring every 4 hours with NAS assessment tool
- Use scores to guide management
- Symptom based approach
  - Basic starting dose for all babies and then titrate up or down depending on NAS scores
  - Score of 8 is typically used as threshold for increasing or decreasing dose
Meriter Hospital

- Start pharmacologic treatment when 3 consecutive scores ≥ 8 or 2 consecutive scores ≥ 12
  - Start treatment with oral morphine 0.04 mg/kg every 3-4 hours
  - Increase dose by 0.02 mg/kg every 8 hours if scores continue to be ≥ 8 after treatment is started
  - Once symptoms are controlled maintain dose for 3 days
  - Wean morphine by 10-20% of initial dose every 2-3 days as tolerated
  - If symptoms recur, increase dose to previous dose that controlled symptoms and continue for 24-48
  - Resume wean
  - When at low dose 0.05 mg increase dosing interval
  - Consider discontinuing morphine when stable on 0.05 mg every 6-8 hours

Jansson et al

- Goal is to keep baby in Category 0
- Initiate morphine as above
- For scores ≥ 8 after treatment starts, increase dose every 4 hours by half of the initiating dose in the score category
- Maintain dose that keeps baby in category 0 for 48 hours, then wean by 0.02 mg every 24 hours
- If baby scores in category 1 or higher, rescore in 1 hour. If both scores in category 1 or higher, increase dose by one quarter the initiating dose for the category and maintain until scores in category 0 for 48 hours

Adjunctive Therapy

- Infants whose symptoms are difficult to control on morphine alone
- Infants who have had multiple drug exposures
- Phenobarbital
  - Loading dose 10-15 mg/kg
  - Maintenance dose 4 mg/kg/day
    - Do not weight adjust if symptoms are controlled
    - Allow medication to self-taper over 2-4 weeks

Don’t Ignore It… Score it!

References

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