# Neonatal Abstinence Syndrome Scoring Models, are the Newer Models Better?

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# Understanding NAS


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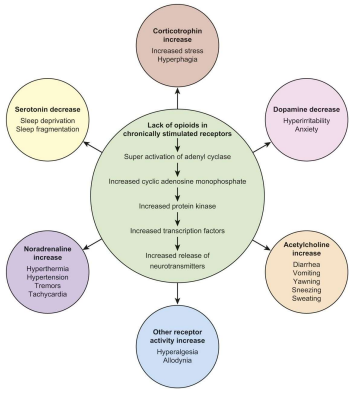
A schematic illustration of the mechanism of opioid withdrawal in neonates.




Prabhakar Kocherlakota Pediatrics 2014;134:e547-e561

PEDIATRICS



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# Neonatal Abstinence Scoring

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## NAS Scoring Tools

- Original Finnegan- 32 items/scoring 1-5
  - Tx initiated for ≥ 8 on 3 consecutive scores
- Modified Finnegan- 21 items/scoring 1-5
  - Eliminated dehydration, levels of excoriation
  - General accepted treatment threshold:
    - ≥ 8 on 3 consecutive scores
    - ≥ 12 on 2 consecutive scores
    - Treatment threshold not validated (based off original Finnegan)
- Finnegan Symptom Prioritization
  - Utilizes Finnegan but focuses on symptom severity
- Eat, Sleeps, Consoles Model
  - Focuses on infant's function (ability to eat, sleep or console related to NAS symptoms) and maximizing non-pharmacological care

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## Pitfalls of Scoring Tools

- Developed to assess withdrawal primarily from opiates
- Developed for use with fixed feeding schedules
- Reliable use requires training
- May not be as accurate for infants which are preterm or older than one month
- Insufficient validation of many of the tools, especially regarding threshold of treatment
- Subjective and difficult to use consistently



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# Modified Finnegan

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# Modified Finnegan

- Comprehensive instrument which assigns a cumulative score based on observation of 21 items relating to symptoms of neonatal withdrawal.
- Non-pharmacological care intervention isn't built into tool
- Does not look at infant's function within an assigned score

Hudak & Tan, The Committee on Drugs and Newborn. *Clinical Report Neonatal Drug Withdrawal.* Pediatrics 2012; 129 e 540-e560.

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## SCORING AREAS

- CNS DISTURBANCES
- METABOLIC, VASOMOTOR AND RESPIRATORY DISTURBANCES
- GASTROINTESTINAL DISTURBANCES



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## Threshold for Pharmacologic Treatment

- Treatment threshold based off original Finnegan
- Rule of 24 is generally recognized
  - 8 or greater for 3 consecutive scores
  - 12 or greater for 2 consecutive scores



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# Newer Models for Consideration

- Finnegan Symptom Prioritization
- Eat, Sleep and Console Model of Care

- Key concepts
  - Evaluate symptoms based off infant's ability to function
  - Provision of non-pharmacological care



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## NAS Symptoms: Concerning or Not?

- It is important to be cognizant of all NAS symptoms
  - NAS symptoms may increase and become more severe leading to dysfunction in basic newborn abilities
  - While poor feeding, inconsolability, crying are considered "the concerning" symptoms, remember other NAS symptoms can potentiate or cause these symptoms
  - NAS symptoms are a sign that infant is experiencing withdrawal, withdrawal has the potential to escalate
  - Recognition of NAS symptoms allows for targeting of non-pharmacological measures

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# Finnegan Symptom Prioritization

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## Wachman

- Modified NAS Treatment Criteria
  - Traditionally Rx for: 2 NAS scores ≥ 8 or 1 score ≥ 12
  - Moved to team huddles and assessment of symptoms prior to tx
    - Huddles included parent, nurse, physician
    - Assessed infant's withdrawal symptoms and intervened in predominance of:
      - Poor feeding
      - Excessive vomiting
      - Diarrhea
      - Poor consolability
      - Poor sleep
    - Assessed non-pharmacologic care
      - First intervention: increase non-pharmacological care
      - Second intervention: medications only after non-pharmacological care maximized and faile

Wachman, EM, et al. *Quality improvement initiative to improve inpatient outcomes for Neonatal Abstinence Syndrome.* Journal of Perinatology 2018; 38(8)

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## Wachman

- Quality Improvement Project
  - PDSA cycle 1:
    - Non-pharmacologic Care Bundle
      - Prenatal parent meetings
      - Engaging parents in non-pharmacologic care/rooming in
    - Finnegan symptom prioritization
      - Changed pharm tx initiation from ≥8 x 2 or ≥12 x 1 to performing team huddle. Reviewed: poor feeding, excessive vomiting, diarrhea, poor consolability and/or poor sleep and assessed non-pharmacological care



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## Wachman

- Results:
  - Parental engagement key component of the QI bundle to improved outcomes
  - Improved outcomes occurred with non-pharmacologic bundle and Finnegan symptom prioritization. No signification change after in outcomes after switching to ESC



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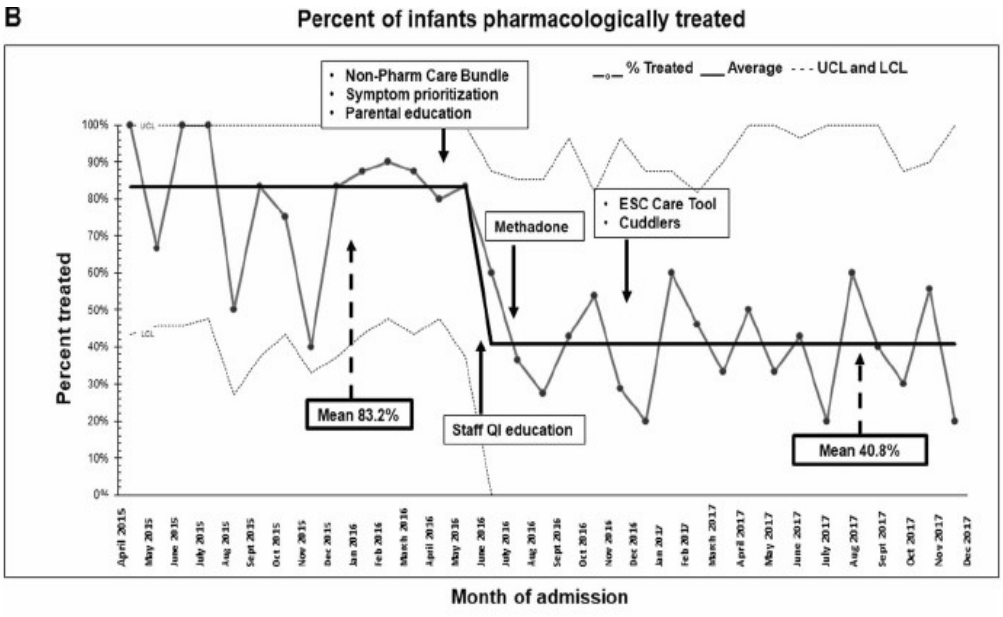


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# NAS/NOWS Symptoms

| CNS Hyperexcitability | Autonomic Dysregulation | Gastrointestinal Disturbances |
|---|---|---|
| High-pitched crying/excessive | Fever | Excessive sucking |
| Sleeplessness | Sweating | Poor/disorganized feeding |
| Hyperactive moro | Yawning | Regurgitation |
| Undisturbed tremors | Mottling | Projectile vomiting |
| Increased muscle tone | Nasal stuffiness | Loose stools |
| Myoclonic jerks | Sneezing | Watery stools |
| Seizures | Tachypnea | |

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# Eat, Sleep and Console Model of Care



## Concepts in Eat, Sleep and Console NAS Model

- Development of Novel Function-based NAS Assessment and Management Approach
  - Can the baby eat?
  - Can the baby sleep?
  - Can the baby be consoled?

## ESC Model of Care

- NAS Model of Care which incorporates ESC behaviors, non-pharmacologic care interventions (NPI), clustering of care and staff and parent/care giver assessments
- Each assessment provides opportunity to reinforce NPI
  - Affirms NPI in place
  - Provides avenue to educate on NPIs that can be increased



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## Assessments

- Assessments are done with infant's waking and feedings
  - Assessment reflects time period from ESC assessment to ESC assessment (feeding to feeding)
  - Infant will be assessed on ESC behaviors of eating, sleeping and consoling. NAS symptoms/severity will be evaluated and determined to be/not to be contributing to infant's inability to eat, sleep, console.
  - Assessment of all NPIs to assure all are maximized



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# ESC Behaviors: Eating

- Takes > 10 minutes to coordinate feeding with showing hunger cues due to NAS

OR

- Breastfeeds < 10 min due to NAS (or other age-appropriate duration)

OR

- Alterative Feeding < 10 ml due to NAS (or other age-appropriate volume)

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# ESC Behaviors: Eating

- Do not indicate Yes to poor feeding if factors are non-opioid related:
  - Prematurity
  - Transitional sleepiness
  - Spittiness in first 24 hours
  - Inability to latch due to infant/maternal anatomical factors



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## ESC Behaviors: Sleeping

- Sleeps < 1 hour due to NAS
  - Infant is unable to sleep for at least one hour, after feeding well due to NAS symptoms (fussiness, restlessness, increased startle, tremors)
  - Do not indicate Yes to poor sleep if related to non-opioid factors:
    - Symptoms of nicotine/SSRI withdrawal
    - Physiologic cluster feeding in initial few days of life
    - Interruptions in sleep for routine newborn testing



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## ESC Behaviors: Consoling

- Unable to Console
  - Takes > 10 min to console or cannot stay consoled for > 10 min due to NAS despite infant caregiver/provider best efforts to implement NPIs
  - Do not indicate Yes to inability to console if infant's difficulty consoling is related to non-opioid factors:
    - Caregiver non-responsiveness to hunger cues
    - Circumcision pain



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## Non-pharmacologic Interventions

- Rooming-in
- Parent/caregiver presence
- Holding by parent/caregiver/cuddler
- Skin to skin
- Safe swaddling
- Optimal feeding
- Quiet, low light environment
- Non-nutritive sucking
- Rhythmic movement
- Additional help
- Visitor limitation
- Clustering care
- Parent/caregiver self-care

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## ESC Plan of Care

- Parent/Caregiver Huddle:
  - Preformed when infant receives Yes to any ESC item or 3 on consoling support
  - RN bedside huddle with parent/caregiver to formally review NPIs that can be increased.
- Full Care Team Huddle:
  - Preformed when an infant receives a 2nd consecutive Yes for the same ESC item or 3 on consoling support
  - Formal huddle with parent/caregiver, infant's RN and physician or associate provider to consider etiologies for symptoms and determine need of pharmacological treatment

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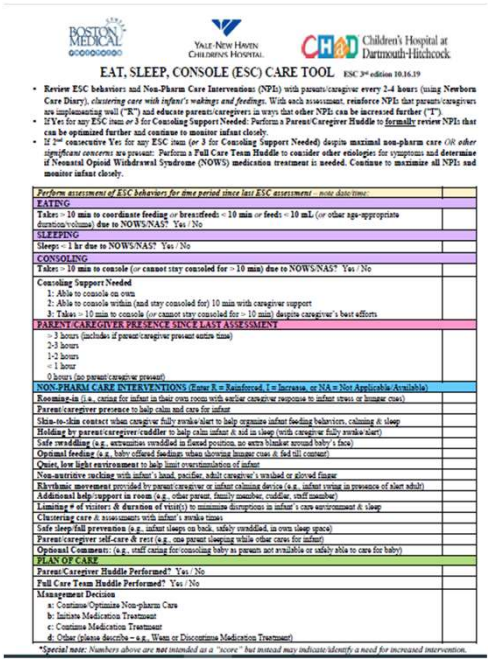

## EAT, SLEEP, CONSOLE (ESC) CARE TOOL ESC 3rd edition 10.16.19

- **Review ESC behaviors** and **Non-Pharm Care Interventions** (NPIs) with parent/caregiver **every 2-4 hours** (using **Newborn Care Diary**), *clustering care with infant's wakings and feedings*. With each assessment, **reinforce NPIs** that parent/caregivers are implementing well ("R") and **educate parents/caregivers** in ways that other NPIs can be increased further ("I").
- If Yes for any ESC item *or 3* for **Consoling Support Needed:** Perform a **Parent/Caregiver Huddle** to **formally review NPIs that can be optimized further** and **continue to monitor infant closely.**
- If 2nd **consecutive Yes** for any **ESC** item (*or 3* for **Consoling Support Needed**) despite **maximal non-pharm care** *OR other significant concerns* are present: Perform a **Full Care Team Huddle** to **consider other etiologies** for symptoms and **determine if Neonatal Opioid Withdrawal Syndrome (NOWS) medication treatment is needed. Continue to maximize all NPIs and monitor infant closely.**

| *Perform assessment of ESC behaviors for time period since last ESC assessment – note date/time:* | |
|---|---|
| **EATING** | |
| **Takes > 10 min to coordinate feeding** *or* **breastfeeds < 10 min** *or* **feeds < 10 mL** (*or* other age-appropriate duration/volume) **due to NOWS/NAS?** Yes / No | |
| **SLEEPING** | |
| **Sleeps < 1 hr due to NOWS/NAS?** Yes / No | |
| **CONSOLING** | |
| **Takes > 10 min to console** (*or* **cannot stay consoled for > 10 min) due to NOWS/NAS?** Yes / No | |
| **Consoling Support Needed**<br>1: Able to console on own<br>2: Able to console within (and stay consoled for) 10 min with caregiver support<br>3: Takes > 10 min to console (*or* cannot stay consoled for > 10 min) despite caregiver's best efforts | |
| **PARENT/CAREGIVER PRESENCE SINCE LAST ASSESSMENT** | |
| > 3 hours (includes if parent/caregiver present entire time)<br>2-3 hours<br>1-2 hours<br>< 1 hour<br>0 hours (no parent/caregiver present) | |
| **NON-PHARM CARE INTERVENTIONS** (Enter R = Reinforced, I = Increase, or NA = Not Applicable/Available) | |
| **Rooming-in** (I.e., caring for infant in their own room with earlier caregiver response to infant stress or hunger cues) | |
| **Parent/caregiver presence** to help calm and care for infant | |
| **Skin-to-skin contact** when caregiver fully awake/alert to help organize infant feeding behaviors, calming & sleep | |
| **Holding by parent/caregiver/cuddler** to help calm infant & aid in sleep (with caregiver fully awake/alert) | |
| **Safe swaddling** (e.g., extremities swaddled in flexed position, no extra blanket around baby's face) | |
| **Optimal feeding** (e.g, baby offered feedings when showing hunger cues & fed till content) | |
| **Quiet, low light environment** to help limit overstimulation of infant | |
| **Non-nutritive sucking** with infant's hand, pacifier, adult caregiver's washed or gloved finger | |
| **Rhythmic movement** provided by parent/caregiver or infant calming device (e.g., infant swing in presence of alert adult) | |
| **Additional help/support in room** (e.g., other parent, family member, cuddler, staff member) | |
| **Limiting # of visitors & duration of visit(s)** to minimize disruptions in infant's care environment & sleep | |
| **Clustering care** & assessments with infant's awake times | |
| **Safe sleep/fall prevention** (e.g., infant sleeps on back, safely swaddled, in own sleep space) | |
| **Parent/caregiver self-care & rest** (e.g., one parent sleeping while other cares for infant) | |
| **Optional Comment:** (e.g., staff caring for/consoling baby as parents not available or safely able to care for baby) | |
| **PLAN OF CARE** | |
| **Parent/Caregiver Huddle Performed?** Yes / No | |
| **Full Care Team Huddle Performed?** Yes / No | |
| **Management Decision**<br>a: Continue/Optimize Non-pharm Care<br>b: Initiate Medication Treatment<br>c: Continue Medication Treatment<br>d: Other (please describe – e.g., Wean or Discontinue Medication Treatment) | |

**Special note:* *Numbers above are not intended as a "score" but instead may indicate/identify a need for increased intervention.*

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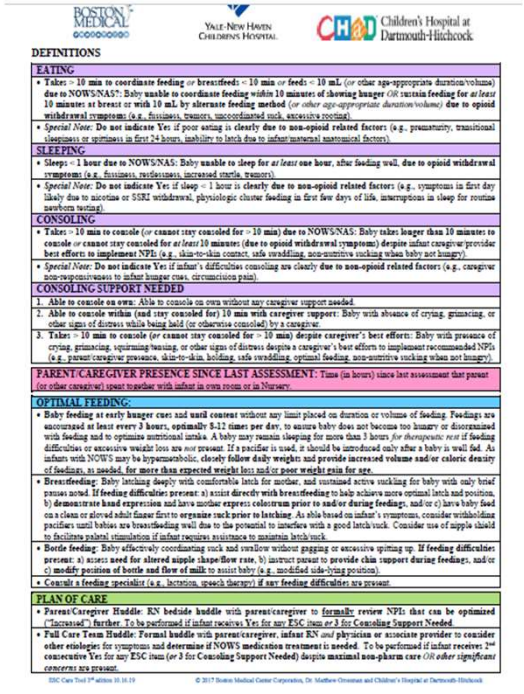

## DEFINITIONS

**EATING**

- **Takes > 10 min to coordinate feeding** *or* **breastfeeds < 10 min** *or* **feeds < 10 mL** (*or* other age-appropriate duration/volume) **due to NOWS/NAS?: Baby unable to coordinate feeding** *within* **10 minutes of showing hunger** *OR* **sustain feeding for** *at least* **10 minutes at breast** *or* **with 10 mL by alternate feeding method** (*or other age-appropriate duration/volume*) **due to opioid withdrawal symptoms** (e.g., fussiness, tremors, uncoordinated suck, excessive rooting).
- *Special Note:* **Do not indicate Yes** if poor eating is **clearly due to non-opioid related factors** (e.g., prematurity, transitional sleepiness or spiritiness in first 24 hours, inability to latch due to infant/maternal anatomical factors).

**SLEEPING**

- **Sleeps < 1 hour due to NOWS/NAS: Baby unable to sleep for** *at least* **one hour**, after feeding well, **due to opioid withdrawal symptoms** (e.g., fussiness, restlessness, increased startle, tremors).
- *Special Note:* **Do not indicate Yes** if sleep < 1 hour is **clearly due to non-opioid related factors** (e.g., symptoms in first day likely due to nicotine or SSRI withdrawal, physiologic cluster feeding in first few days of life, interruptions in sleep for routine newborn testing).

**CONSOLING**

- **Takes > 10 min to console** (*or* **cannot stay consoled for > 10 min) due to NOWS/NAS: Baby takes longer than 10 minutes to console** *or* **cannot stay consoled for** *at least* **10 minutes (due to opioid withdrawal symptoms) despite infant caregiver/provider best efforts to implement NPIs** (e.g., skin-to-skin contact, safe swaddling, non-nutritive sucking when baby not hungry).
- *Special Note:* **Do not indicate Yes** if infant's difficulties consoling are **clearly due to non-opioid related factors** (e.g., caregiver non-responsiveness to infant hunger cues, circumcision pain).

**CONSOLING SUPPORT NEEDED**

1. **Able to console on own:** Able to console on own without any caregiver support needed.
2. **Able to console within** (and stay consoled for) **10 min with caregiver support:** Baby with absence of crying, grimacing, or other signs of distress while being held (or otherwise consoled) by a caregiver.
3. **Takes > 10 min to console** (*or* **cannot stay consoled for > 10 min) despite caregiver's best efforts:** Baby with presence of crying, grimacing, squirming/twisting, or other signs of distress despite a caregiver's best efforts to implement recommended NPIs (e.g., parent/caregiver presence, skin-to-skin, holding, safe swaddling, optimal feeding, non-nutritive sucking when not hungry).

**PARENT/CAREGIVER PRESENCE SINCE LAST ASSESSMENT:** Time (in hours) since last assessment that parent (or other caregiver) spent together with infant in own room or in Nursery.

**OPTIMAL FEEDING:**

- **Baby feeding at early hunger cues** and **until content** without any limit placed on duration or volume of feeding. Feedings are encouraged **at least every 3 hours, optimally 8-12 times per day**, to ensure baby does not become too hungry or disorganized with feeding and to optimize nutritional intake. A baby may remain sleeping for more than 3 hours *for therapeutic rest* if feeding difficulties or excessive weight loss are *not* present. If a pacifier is used, it should be introduced only after a baby is well fed. As infants with NOWS may be hypermetabolic, **closely follow daily weights and provide increased volume and/or caloric density of feedings, as needed, for more than expected weight loss and/or poor weight gain for age.**
- **Breastfeeding**: Baby latching deeply with comfortable latch for mother, and sustained active suckling for baby with only brief pauses noted. **If feeding difficulties present:** a) **assist directly with breastfeeding** to help achieve more optimal latch and position, b) **demonstrate hand expression** and have mother **express colostrum prior to and/or during feedings**, and/or c) have baby **feed** on a clean or gloved adult finger first to **organize suck prior to latching**. As able based on infant's symptoms, consider withholding pacifiers until babies are breastfeeding well due to the potential to interfere with a good latch/suck. Consider use of nipple shield to facilitate paternal stimulation if infant requires assistance to maintain latch/suck.
- **Bottle feeding**: Baby effectively coordinating suck and swallow without gagging or excessive spitting up. **If feeding difficulties present:** a) **assess need for altered nipple shape/flow rate**, b) **instruct parent to provide chin support during feedings**, and/or c) **modify position of bottle and flow of milk** to assist baby (e.g., modified side-lying position).
- **Consult a feeding specialist** (e.g., lactation, speech therapy) **if any feeding difficulties** are present.

**PLAN OF CARE**

- **Parent/Caregiver Huddle**: **RN bedside huddle** with **parent/caregiver** to **formally review NPIs that can be optimized** ("Increased") **further**. To be performed if infant receives Yes for any ESC item *or 3* for Consoling Support Needed.
- **Full Care Team Huddle**: **Formal huddle** with **parent/caregiver, infant RN** *and* physician or associate provider to **consider other etiologies** for symptoms and **determine if NOWS medication treatment is needed**. To be performed if infant receives 2nd **consecutive Yes** for any ESC item (*or 3* for **Consoling Support Needed**) despite **maximal non-pharm care** *OR other significant concerns* are present.




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## Which Tool is Right?

- Not necessarily a “right” tool.
- Key is consistent use and standard education of tool
- Use of a non-pharmacological bundle along with NAS tool is essential
- Correlation with patient data, exam and scoring trends are a must