

NIV NAVA Protocol

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Purpose: To outline the nursing and respiratory care management of the infant receiving NIV NAVA via the Servo I ventilator in the NICU.

Background: Neurally Adjusted Ventilatory Assist (NAVA) may be used on all patients requiring ventilator assistance, provided that the electrical signal from the brain to the diaphragm is intact and that there is no contraindication for insertion/exchange of a nasogastric tube. NAVA delivers assist in proportion to and in synchrony with the patient's respiratory efforts. These efforts are reflected by the **Edi signal**, which represents the electrical activity of the diaphragm preceding muscular contraction. The **NAVA level** is the factor by which the Edi signal is multiplied to adjust the amount of assist delivered to the patient. The set NAVA level reflects the amount of work of breathing that the ventilator will take over from the patient. Backup settings are selected to ensure respiratory support in case of apnea.

9 electrodes within the Edi catheter sit adjacent to the diaphragm and are positioned with the tip of the catheter in the stomach. The Edi catheter is validated for 5 days of use, both for feeding and when using the NAVA function. **The Edi catheter is NOT MRI compatible.**

Criteria: **Patients to consider using NAVA for are:**

Low birth weight neonates meeting extubation criteria requiring NIV support

Mild to Moderate RDS where intubation is to be avoided

Neonates on NIV with apnea

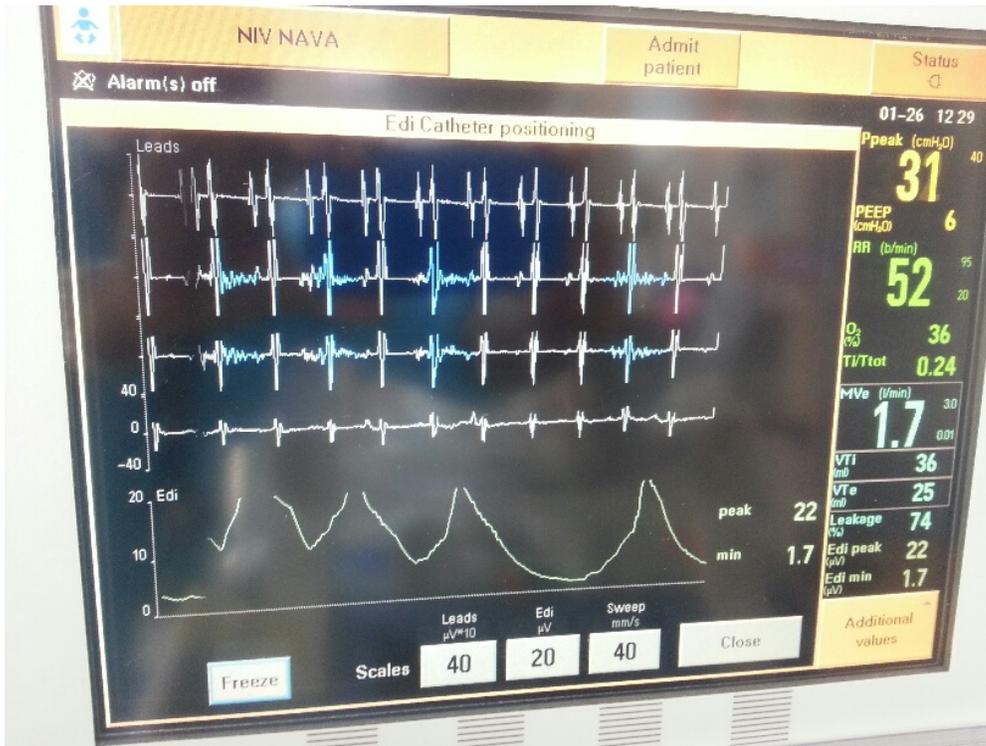
NIV NAVA should be avoided as a rescue therapy and should be implemented before the patient is in respiratory failure.

- Equipment:**
1. Servo I with NAVA software, Edi Module and Edi Cable
 2. Appropriate Edi catheter size:
 - 6 Fr 49 cm Patient weight < 1kg
 - 6 Fr 50 cm Patient weight > 1kg
 - 8 Fr 100 cm Patient weight > 2.5 kg
 3. RAM cannula (available in Micro Premie, Premie, and Newborn)
 4. Sterile water to dip Edi catheter in prior to insertion

Procedure: The Edi catheter is inserted by the bedside nurse and RT and is adjusted to provide an optimal signal and position. Look for the babies Edi signal. There should be peaks and valleys. **The Edi peak should range from 5 to 15, Edi minimum from 2 to 4.** These represent the normal range for the Edi signal of a neonate.

THIRD: Where do the blue highlights appear in the ECG signal each time the baby sends an Edi signal to the ventilator? Ideal is in the 2nd and 3rd line which means the middle section of electrodes (wires) are picking up the strongest Edi signal. This allows for movement of the catheter and still pick up a good diaphragm signal. (See below)

If the blue is in the top line only.... the catheter is in too far so withdraw 0.5 to 1.0 cm. If the blue is in the bottom line....the catheter is not deep enough; advance 0.5 to 1.0 cm



Example of ideal catheter placement

12. Once correct position is established, then initiate the below process:

13. Open "Select Ventilation Mode"

14. Select NIV NAVA

Initial Settings:

Back up ventilation for NIV NAVA is NIV PC

NAVA level: 2.0 cmH₂O/ μ V

Back-up PC above PEEP: 15 cmH₂O

PEEP: 6 cmH₂O

Back-up RR: 40 b/min

Trigg Edi: 0.5 μ V

Back-up IT: 0.5 sec

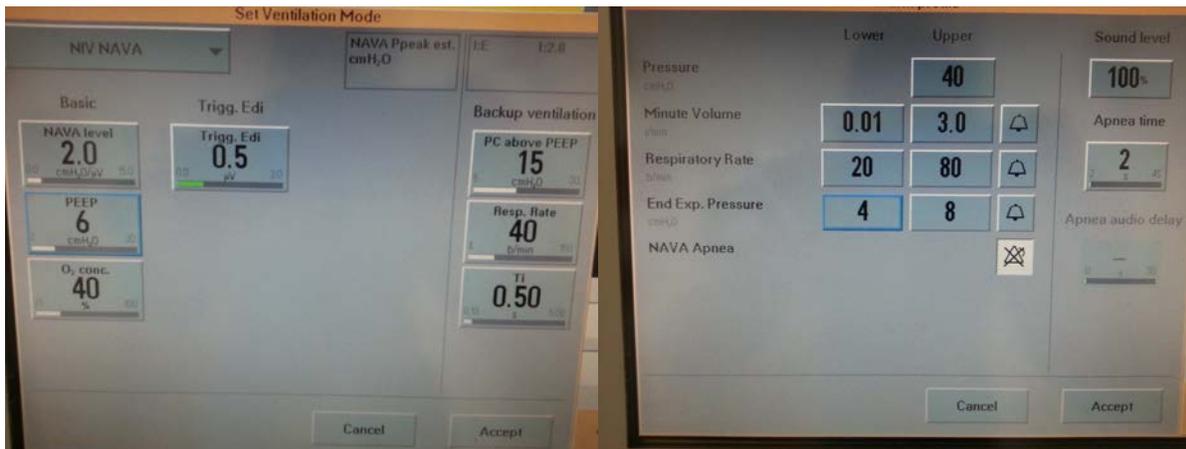
*If the patient is already being ventilated in NIV PC, the initial NAVA Level can be set in the NAVA Preview window, which is opened via the Neural Access fixed key or (Blank space) fixed key. The user presses "NAVA level" in this window and uses the main rotary dial to set it appropriately. **Caution should be taken to ensure the NAVA level is not too high as this may suppress the Edi signal (respiratory drive)***

Alarms:

High Pressure 40 cmH₂O (It is important to set a suitable upper limit for pressure. The maximum available pressure level is 5 cmH₂O below the preset upper pressure limit. The "Regulation Pressure Limited" message appears when Ppeak is 5 cmH₂O below the upper pressure limit. **The maximum peak pressure is 32 cmH₂O.**

Apnea time 2.0 sec for preemies (set at 3-5 sec for larger babies)

Disable the NAVA Apnea Alarm by pressing the button. When you see an X then it is deactivated. (See below)



Above settings are recommended **Initial settings** only, and should be titrated up or down to best support the patient's ventilation needs.

Management Strategies: Steps done after verification of correct Edi catheter placement

- Start with the **Initial Settings (NAVA level 2.0)** and watch the patient's work of breathing (WOB), as well as take note of the Edi signal. The NAVA level is the number that determines how much work the patient does compared to the ventilator.
- The resulting Edi peak value that is registered will provide useful information that will allow the user to assess the total muscle load or weakness.
- Increase the NAVA level in steps of 0.1 cmH₂O/ μ V with the aim of achieving a decrease in the Edi signal. (**Normal Edi Peak range is 5-15, Edi min is 2-4**)
- The Edi signal is followed carefully while the NAVA level is slowly increased in small increments. The Edi signal helps the clinician to quantify and continuously evaluate the patient's respiratory work.
- **Edi Peak (range 5-15 μ V)- demonstrates active contraction of the diaphragm**
 - **If the Peak Edi is too high, increase the NAVA level to reduce the patient's WOB**
 - **If the Peak Edi is too low, reduce the NAVA level and consider weaning**
- **Edi Min (range 2-4 μ V)- demonstrates resting state of diaphragm**
 - **If the Edi min is too high, increase the PEEP**
 - **If the Edi min is too low, decrease the PEEP**
- As the NAVA number is increased, peak pressures will increase proportionally until a "break point" is reached. After this point the peak pressure will remain stable and the Edi peak will decrease with further increase in the NAVA number.
- The adequate NAVA level will be when the peak pressure no longer increases and the Edi peak decreases with further NAVA level increases.

WEANING

Then first sign that it's possible to wean the patient is a decline in the Edi signal and peak pressure. (**NOTE: assure that the decline in the Edi signal is not from sedation bolus or an increase in maintenance dose of sedatives**). This signifies that there's an improvement in

neuromuscular coupling in the sense that diaphragm performance is unchanged at a lower level of stimulation. NAVA levels should be decreased by 0.1 -0.2 cmH₂O/ μ V increments.

Troubleshooting:

1. **Patient is apneic:** the Servo I will automatically switch to Back up ventilation, which is NIV Pressure Control. Assure that the apnea time is set appropriately. If the ventilator alarms during switches please check that NAVA Apnea is disabled.
2. **Edi catheter is accidentally removed:** If the Edi catheter is accidentally removed the Servo I will automatically switch to NIV PC back up ventilation.
3. **No Edi signal detected:** Check that the Edi Catheter is connected and in the correct position by using the Edi Catheter Positioning Window.
4. **Check Catheter position/Edi invalid alarm – High Priority alarm** concerns the Edi Catheter and means that there is no Edi signal that the vent can work with. Check to make sure the Edi catheter is connected to the Edi cable. Patient will be ventilated in back up ventilation until corrected. Once the Edi catheter is re-connected and there's a valid Edi signal, the ventilator will switch back to NIV NAVA. **(This may also happen if the wrong size Edi catheter is used, ie: if catheter is too small)**
5. **Check Catheter position/RR and HR coupling alarm-** High Priority alarm. The software is alerting you that the ECG signal may be filtering into the Edi signal. The most common cause is when the baby has a rapid respiratory rate and comes closer to the HR. The Edi signal may be correct but the ventilator is unsure. Slightly advancing the catheter can help this condition. Another option is to increase the Edi trigger to 0.7 or 0.8. This will increase filtering of smaller, ineffective respiratory efforts.
6. **Unreliable Edi Signal alarm-** High Priority alarm The Edi signal must cross from the diaphragm to the esophagus for the NAVA catheter to detect. If the catheter has floated away from the esophagus wall this alarm may be triggered. It is most often seen during bolus feedings. The catheter floats in the fluid dampening the signal quality. Once the feed moves through this alarm is alleviated. In addition, check Edi catheter placement. May need to upsize the Edi catheter to 8 Fr if the patient is close to 2.5 kg with a 6 Fr 50cm.
7. **When in doubt-** When you're not sure what's going on, always check the Edi catheter position to assure it's picking up a strong signal in the correct place.
8. **RN needs to reposition catheter** - RCP needs to be at the bedside for repositioning of the Edi catheter to confirm correct placement.

