Royal Hospital for Women (RHW)
NEONATAL BUSINESS RULE
COVER SHEET

Health
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EXECUTIVE SPONSOR	Sally Wise, Nursing Co-Director Neonatal Services Srinivas Bolisetty, Medical Co- Director Neonatal Services
AUTHOR	S Bolisetty (Medical Co- Director), J Smyth (Staff Specialist)
SUMMARY	To provide effective and appropriate non-invasive and invasive NAVA as respiratory support to neonates with respiratory insufficiency using Maquet (Getinge) SERVO-n® ventilator.
Key Words	NAVA, invasive, non- invasive, respiratory support, ventilation, Edi, neonate

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Neurally Adjusted Ventilatory Assist (NAVA) in Neonates

RHW CLIN183

Contents

Within this document we will use the term woman, this is not to exclude those who give birth and do not identify as female. It is crucial to use the preferred language and terminology as described and guided by each individual person when providing care.

1 BACKGROUND

Neurally Adjusted Ventilatory Assist (NAVA) delivers ventilation in synchrony with and in proportion to the neonate's efforts. The neonate's own electrical diaphragmatic activity (Edi) is used to trigger each assisted breath. The pressure delivered depends on the size of the Edi signal, thus providing well synchronized proportional assist ventilation. When using the Edi to control all aspects of the ventilator breath, the patient determines inspiratory pressure (or volume), inspiratory and expiratory time, and respiratory rate for each breath.

Definitions:

Electrical diaphragmatic activity (Edi)	Edi is the electrical activity of the diaphragm and can be thought of as a respiratory vital sign. The electrical signal from the crural part of the diaphragm is summated, filtered and processed to give the Edi signal. It is measured in microvolts (μV).
Edi peak	The maximal electrical activity of the diaphragm for a particular breath and is responsible for the size of the breath (the "effort of the breath"). It indicates the amount of effort being made to breath in and correlates with the Work of Breathing (WOB).
Edi min	The electrical activity of the diaphragm at rest between inspiratory efforts. It represents the spontaneous background tonic activity of the diaphragm which prevents de-recruitment of alveoli during expiration. If high can indicate that the neonate trying to generate positive end expiratory pressure (PEEP) itself.
Edi trigger (in μV)	The minimum increase in Edi activity that is recognised by the ventilator as a breath. When the ventilator is being triggered, the Edi trigger is represented as a white line on the Edi trace. Edi trigger is generally set at 0.5 μV.
NAVA Level	A conversion factor that transfers the Edi signal into a proportional pressure measured as cmH_2O/mV. It determines the delivered peak inspiratory pressure

	support the baby receives based on the Edi peak and Edi min values. For each breath, the peak pressure is determined by the formula: Ppeak = NAVA level x Edi (peak – min) + PEEP

2 RESPONSIBILITIES

2. **Medical/NNP**- identify neonates that require either non- invasive or invasive NAVA ventilation, prescribe NAVA ventilation settings, monitor and manage neonates requiring NAVA ventilation, identify neonates that can be weaned from NAVA support and wean settings appropriately, escalate respiratory support as required, inform and educate parent/carers on NAVA ventilation as appropriate.

2.2 Nursing- initiate non-invasive or invasive NAVA ventilation when directed by medical officer, monitor and manage neonates on NAVA ventilation, escalate clinical concerns when indicated to medical officer, inform and educate parent/carers on NAVA ventilation as appropriate.

3 PROCEDURE

3. Equipment

- Maquet (Getinge) Servo-n® ventilator set up, ready to use
- Edi catheter (Appendix 2)

3. Indication for use

- Primary respiratory support to avoid intubation
- Escalating respiratory support from nasal Continuous Positive Airway Pressure (nCPAP) to avoid intubation
- Weaning from invasive respiratory support
- Monitoring Edi activity (respiratory effort) post-extubation
- Treating apnoea with backup ventilation

3. Contraindications for NAVA

- Magnetic Resonance Imaging (MRI) scanning (remove and reserve Edi catheter before entering MRI area)
- Insufficient/absent respiratory effort (brain anomaly, medication)
- Anatomical anomaly (oesophageal atresia, severe diaphragmatic hernia)
- Phrenic nerve injury
- Congenital myopathy

3. Clinical Practice

3.4.1 Edi Catheter Insertion

- Refer to NAVA Nursing Management for Non- Invasive Ventilation CBR

3.4.2 Non-Invasive NAVA (NIV-NAVA) – (Appendix 5)

- In NIV-NAVA mode a leak is to be expected. The ventilator will compensate for this of up to ≥ 90% will still deliver ventilation as set.

3.4.2.1 Primary non-invasive respiratory support

- Commence NIV NAVA from 27 weeks gestational age.

Suggested setting – Primary respiratory support	
PEEP	6-8 cmH_2O
Inspiratory Time (IT)	0.35 seconds
Backup rate	40-60 breaths per minute (bpm)
Backup Pressure Control (PC)	10-12 cmH_2O above PEEP
Apnoea time	2-3 seconds
Nava level	1-1.5 µV/cmH_2O

3.4.2.2 Escalating respiratory support from nCPAP therapy

- Commence NIV NAVA
  - To recruit lungs,
  - To reduce work of breathing
  - To avoid intubation.

Suggested setting - Escalation during nCPAP respiratory assistance	
PEEP	6-8 cmH_2O
Ti	0.35 seconds
Backup rate	40-60 bpm
Backup PC	10-12 cmH_2O above PEEP
Apnoea time	2-3 seconds
Nava level	1.5-2 µV/cmH_2O

Note
Set the peak pressure alarm 5 cmH_2O above the desired peakP, otherwise, the ventilator will keep alarming.

3.4.2.3 Weaning from invasive respiratory support

- Commence NIV NAVA
  - To facilitate early extubation
  - To prevent de-recruitment
  - To avoid reintubation
- Place Edi catheter prior to extubation if not already in place.
- Note the ventilator parameters on invasive mode prior to extubation, particularly tidal volume (Vt), Positive inspiratory pressure (PIP), PEEP, effort of breathing and frequency of apnoea.

Suggested setting - Weaning from invasive respiratory support	
PEEP	6-8 cmH_2O
Ti	0.35 seconds
Backup rate	40-60 bpm
Backup PC	10-12 cmH_2O above PEEP

Apnoea time	2-3 seconds
Nava level	1-1.5 µV/cmH_2O and adjust in 0.2 µV/cmH_2O increments

3.4.2.4 Monitoring Edi activity (respiratory effort) post-extubation

- Visualise Edi activity to determine the adequacy of respiratory support.

3.4.2.5 Treating apnoea as nCPAP therapy with backup facility

- Commence NIV NAVA
  - To recruit lungs
  - To increase non-invasive assistance
  - To avoid intubation

Suggested setting - Threating apnoea as nCPAP therapy with backup facility	
PEEP	6-8 cmH_2O
Ti	0.35 seconds
Backup rate	40-60 bpm
Backup PC	10-12 cmH_2O above PEEP
Apnoea time	2-3 seconds
Nava level	0 µV/cmH_2O
• Backup ventilation is triggered only when neonates become apnoeic	

Note
- Choose NIV-NAVA mode and set NAVA to zero for CPAP therapy.
- If CPAP mode is chosen, the SERVO-n ventilator will constantly alarm warning “leakage detected”.

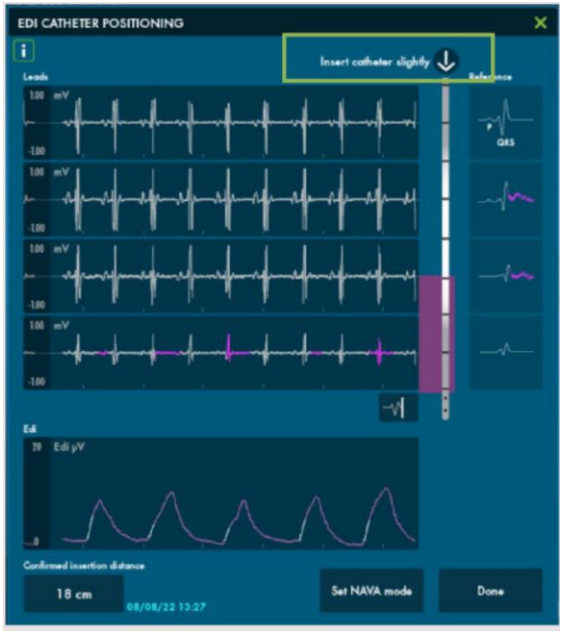
3.4.3 Monitoring and optimising NIV-NAVA (Appendix 3 and 4)

- Ensure Edi Catheter is well positioned (Picture 1).
  - Observe diminishing P waves and QRS complex on the Electrocardiograph (ECG) waveform progressing from the 1st to the 4th lead and the presence of a purple colour in the 2nd and 3rd lead that may fluctuate between the leads.

Picture 1

- Edi Catheter Malposition

Findings/signs	Solution
P waves on all leads and progressively increasing in size from the 1st to 4th lead	Push Edi catheter further in (Picture 2)
No P waves and dampened QRS complex on all 4 leads	Pull out catheter (Picture 3)
Larger P waves and QRS complex on 1st and 4th leads - catheter curled	Reinsert catheter
No Edi signal	No respiratory drive, consider oversedation



Picture 2

Picture 3

Note
- Nasal Edi catheter can be used with nasal prongs and mask, is more secure and easier to manage in comparison to oral Edi catheter.
- Site of nasal Edi catheter is rotated every 7 days.
- The Edi catheter can stay in place for 4 weeks.

- Regularly review the efficiency of the seal between the nasal prongs/mask and the nostril of the neonate.
- Regularly review and document the NAVA level, $_{peak}$P, Edi min, Edi max, breathing effort, percentage of back-up and any gaseous distension of abdomen.
  - If Edi max is consistently < 5 µV - decrease the NAVA level.
  - If Edi max is consistently > 20 µV - increase the NAVA level.
- Increase the NAVA level if under-support detected
  - Fraction of inspired oxygen (FiO_2) is increasing

- Work of breathing worsening
- Edi peaks are increasing
- Review PEEP if Edi min is high, consider increasing

- Decrease the NAVA level if over supported
  - Edi peak low
  - Edi min low
  - FiO_2 decreasing
  - WOB improving
  - Review PEEP if Edi min is low, consider decreasing
- Watch for any air trapping in the gut. Place another gastric tube into stomach when size 6 Edi catheter is used.

> Note
> Although daily weaning of NAVA is recommended, NCC's experience suggests that, once the neonate's respiratory distress improves, weaning of NAVA can be done more frequently.

3.4.4 Weaning from NIV-NAVA

- Ensure FiO_2 <30%
- Review frequency of backup ventilation
- Review spontaneous respiratory rate
  - If back-up is frequent, consider increasing apnoea time and reducing backup PC to increase spontaneous respiratory drive
- Wean NAVA level by 0.2 µV/cmH_2O at a time and review respiratory rate, oxygen saturations, carbon dioxide, heat rate
- Transfer the respiratory support to nCPAP or High Flow Oxygen therapy once the
  - NAVA level is <0.5 µV/cmH_2O,
  - FiO_2 <0.3L/min
  - Edi peak <15 µV
  - Edi min <3 µV

3.4.5 Invasive ventilation (Appendix 1)

3.4.5.1 Pressure Regulated Volume Control (PRVC) Conventional Ventilation- (same as PCAC+VG on Draeger ventilator).

- Primary invasive respiratory assistance at delivery or on admission into NICU of an intubated neonate.
- All breaths are synchronised with the neonate's breath detected by the flow sensor.
  - Settings
    - PEEP 6 cmH_2O
    - Ti 0.35- 0.40 seconds
    - Rate 40-60 bpm
    - VT 4-5mL/kg delivered at the lowest possible inspiratory pressure.

3.4.5.2 Invasive NAVA with PC - (PC AC on Draeger ventilator)

- Sufficient patient respiratory effort on Edi is required, or the ventilator goes into PC mode at the set pressures and rate.
- Setting the initial NAVA level
  - Option 1:
    - Set the NAVA level to 1-1.5 μV/cmH_2O.
    - Titrate NAVA level in 0.2 μV/cmH_2O increments in presence of consultant/fellow to achieve Edi peak 5-15μV.
    - If Edi peak is below 5μV titrate NAVA level down below 1 to optimize the level of support.
  - Option 2:
    - Open the "neural access" menu on the ventilator and select "NAVA preview".
    - Two pressure curves appear in the upper window: a yellow one, that represents the actual pressure delivery, and a grey one that provides an estimation of the pressure delivered (based on actual Edi and NAVA level) if the patient was switched to NAVA at this time.
    - Adapt the NAVA level so that the estimated pressure curve (grey) resembles the actual pressure curve (yellow). If satisfactory, press "Accept".
    - Press "NAVA" in "Select ventilation mode". The NAVA level that appears is based on the level selected in the preview window.

3.4.5.3 Optimising Invasive NAVA (Appendix 3 and 4)

- NAVA level
  - Assess the Edi levels when neonate is settled
  - Change NAVA level by 0.2 μV/cmH_2O at a time depending on Edi max
  - The range of NAVA level is 0.5 – 2.0 μV/cmH_2O
    - Edi peak is consistently <5-10μV - decrease the NAVA level
    - Edi peak is consistently >15μV - increase the NAVA level
- PEEP
  - Set the PEEP at 6-8cmH_2O
    - If Edi min is constantly >3μV (a sign of background tonic diaphragmatic activity to maintain functional residual capacity [FRC]) – decrease PEEP
- Apnoea time
  - Initial apnoea time at 2-3 seconds.
    - If breathing is irregular/apnoeic - decrease apnoea time to between 1-2 seconds.
      - To get to <2 sec, click on the safety scale + sign at the lower right of the apnoea time screen. The apnoea time reduces by 0.2 seconds at a time
    - Make sure the backup ventilation does not hyperventilate the patient preventing spontaneous breathing efforts.
- Edi trigger and sensitivity
  - 0.5 μV and trigger sensitivity 1-2

3.4.5.4 Weaning from NAVA:

- Decrease the NAVA level as the neonate's pulmonary status improves.
- Consider extubation when the NAVA level is <0.5-1 μV/cmH_2O.
- Consider increasing the apnoea time to allow increased frequency of spontaneous breathing efforts.
- Consider decreasing back up ventilation rate.
- Leave Edi catheter in place when extubating to monitor for WOB.

> Note
> The servo-n ventilator can be used as a conventional ventilator using the ventilation modes PRVC, PC (pressure control) and HFOV.

3. Documentation

- eRIC

3. Education Notes

- NAVA is a diaphragm-triggered respiratory support and uses the electrical activity of the crural diaphragm (Edi) to trigger the start and end of a breath. It uses the same nasal interfaces as nCPAP or NIPPV.
- Diaphragmatic activity is determined by assessing Edi with a series of electrodes mounted on a modified intragastric feeding tube (Edi catheter). The definitive data on NAVA's impact on major binary outcomes like Bronchopulmonary Dysplasia (BPD) remains a subject of ongoing research.[1] But NCC's observable effect on patient comfort is compelling. It is consistently noted that neonates on NAVA are more settled and comfortable due to the synchrony between their work of breathing and the delivered ventilatory support.
- The Royal Hospital for Women (RHW) Neonatal Intensive Care Unit (NICU) was the first in Australia to introduce NAVA for use in neonates. Since its commencement in 2015, NAVA, especially in its non-invasive (NIV-NAVA) modality, has become a standardised (or 'first-line') form of respiratory support for preterm neonates requiring assistance exceeding that of Continuous Positive Airway Pressure (CPAP). Our institutional retrospective cohort study showed successful integration of NAVA for 4 main indications (escalation; post-extubation; back up support for apnoea).[2]
- Normal Edi values: Due to the limited data on normal Edi reference values in neonates, we conducted a study in newborn neonates breathing spontaneously in room air and established normal Edi reference values. The mean (±SD) Edi minimum was 3.02 (±0.94) μV and the mean Edi peak was 10.13 (±3.50) μV. In preterm neonates the mean (±SD) Edi minimum was 3.05 (±0.91) μV and the mean Edi peak was 9.36 (±2.13) μV. In term neonates the mean (±SD) Edi minimum was 2.97 (±1.05) μV and the mean Edi peak was 11.66 (±5.14) μV.[3]
- NAVA can also be used to determine the Edi in neonates with unexplained central apnoeas. We published an instructive case report detailing the use of NAVA to demonstrate absent electrical diaphragmatic activity in a neonate subsequently diagnosed with Congenital Central Hypoventilation Syndrome.[4]

- **How NAVA works?**
  - An electrical signal is generated in the respiratory centre in the brain stem and travels via the phrenic nerve to stimulate the diaphragm.
  - The electrical activity of the diaphragm is detected by electrodes embedded in a special gastric tube and transmitted via wires in the gastric tube to the ventilator.[5]
  - The ventilator assists the spontaneous breath by delivering a proportional pressure. The peak inspiratory pressure (PIP or Ppeak) delivered is based on the amount of electrical activity generated by the diaphragm.
  - The PIP is generated until the electrical activity decreases by 40 to 70% and then the breath is terminated. The neonate, by reflex control of diaphragmatic activity, determines the peak inspiratory pressure, inspiratory and expiratory time for each breath and the respiratory rate.[5]
- **Backup trends:** There are 2 backup trends monitoring the frequency and duration of a patient's apnoeas. It can show how often a neonate switches to backup mode during apnoeas and how long they are on backup.[5]
  - Number of Backup/min (Back up ∑) - This indicates the number of times the neonate goes into backup every minute. If the number of backup/min is high and the neonate is stable, the current apnoea time may be too short, and the neonate could tolerate a longer apnoea time. If number of backup/min is high and the neonate is desaturating, the current apnoea time (time without any ventilation) may be too long, consider shortening the apnoea time. If backup/min is low, the neonate is having minimal apnoea at the set apnoea time, consider lengthening the apnoea time.
  - Percent (%) of time in backup ventilation/min (Back up %) - This indicates the amount of time (as a %) the neonate is in backup/min. If % of time in backup ventilation/min is low the neonate may be ready to be weaned by lengthening the apnoea time. If % of time in backup ventilation/min is high, and the number of backup/min are low then the neonate may not be ready to be weaned (the neonate is mostly in backup). If both the % time in backup is high, number of backup/min are high and clinically stable, neonate may be ready to be weaned by lengthening the apnoea time.
- **Points to remember**
  - **Peak Pressure Alarm limit:** The PIP alarm is a safety feature that triggers when the peak pressure in the patient's airway exceeds a pre-set upper limit. On Servo-N ventilator, some modes, have a built-in pressure limiting function that caps the pressure at 5 cm below the set alarm limit.
  - **Pampl alarm limit on HFOV:** The Pampl alarm is a safety feature that triggers when the amplitude in the patient's airway exceeds a pre-set upper limit. Servo-N ventilator has a built-in pressure limiting function that caps the pressure at 3 cm above the set alarm limit.

3. Abbreviations

NAVA	Neurally Adjusted Ventilatory Assist	Edi	Electrical Diaphragmatic Activity
µV	microvolts	WOB	Work of breathing
PEEP	Positive end expiratory pressure	nCPAP	nasal Continuous Positive Airway Pressure
MRI	Magnetic Resonance Imaging	NIV-NAVA	Non-invasive NAVA
Ti	inspiratory time	BPM	Breaths per minute
PC	pressure control	Vt	Tidal volumes
PIP	Positive Inspiratory Pressure	ECG	Electrocardiograph
FiO_2	Fraction of inspired oxygen	PRVC	Pressure Regulated Volume Control

3. Related Policies/procedures

- RHW NCC CBR- Continuous Positive Airway Pressure (CPAP) Therapy
- RHW NCC CBR- Deteriorating neonate - Recognition and management inside newborn care centre
- RHW NCC CBR- Getinge Servo-n ventilator set up
- RHW NCC CBR- Inhaled Nitric Oxide Therapy (iNO)
- RHW NCC CBR- Intragastric Tube Insertion and Maintenance
- RHW NCC CBR- Kangaroo Care - Non-ventilated and ventilated neonate
- RHW NCC CBR- NAVA Nursing Management for Invasive Ventilation
- RHW NCC CBR- NAVA Nursing Management for Non-Invasive Ventilation
- RHW NCC CBR- NeoSeal on nasal CPAP
- RHW NCC CBR- Transfer of neonate on Non-Invasive respiratory support outside of newborn care centre
- RHW NCC CBR- Transfer of ventilated neonate outside of newborn care centre

3. References

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2. Cheng J, Parmar T, Smyth J, Bolisetty S, Lui K, Schindler T. Non-invasive neurally adjusted ventilatory assist (NIV-NAVA) in the neonatal intensive care unit (NICU): an Australian NICU experience. BMC pediatrics. 2024 Aug 9;24(1):514.
3. Gurumahan V, Thavalingam S, Schindler T, Smyth J, Lui K, Bolisetty S. Reference values for diaphragm electrical activity (Edi) in newborn infants. BMC pediatrics. 2022 Sep 23;22(1):559.
4. Sinclair R, Teng A, Jonas C, Schindler T. Congenital central hypoventilation syndrome: A pictorial demonstration of absent electrical diaphragmatic activity using non-invasive neurally adjusted ventilatory assist. Journal of Paediatrics & Child Health. 2018 Feb 1;54(2).
5. Servo-n ventilator (Getinge) user manual. Accessed on 28 November 2025.

4 ABORIGINAL HEALTH IMPACT STATEMENT DOCUMENTATION

- Considerations for culturally safe and appropriate care provision have been made in the development of this Business Rule and will be accounted for in its implementation.
- When clinical risks are identified for an Aboriginal and/or Torres Strait Islander woman or family, they may require additional supports. This may include Aboriginal health professionals such as Aboriginal Liaison Officers, health workers or other culturally specific services

5 CULTURAL SUPPORT

- For a Culturally and Linguistically Diverse CALD woman, notify the nominated cross-cultural health worker during Monday to Friday business hours
- If the woman is from a non-English speaking background, call the interpreter service: NSW Ministry of Health Policy Directive PD2017_044-Interpreters Standard Procedures for Working with Health Care Interpreters.

6 NATIONAL STANDARDS

- Standard 1 Clinical Governance
- Standard 5 Comprehensive Care
- Standard 6 Communicating for Safety
- Standard 8 Recognising and Responding to Acute Deterioration

7 REVISION AND APPROVAL HISTORY

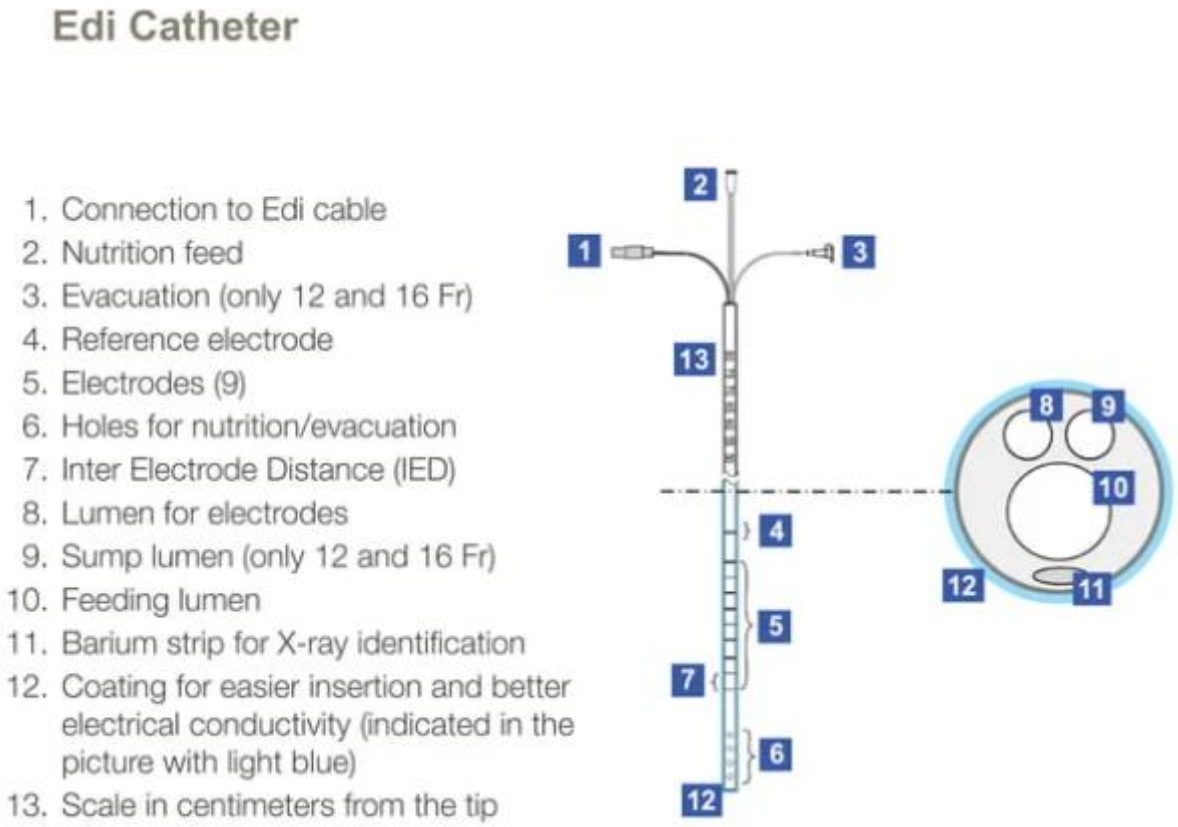
Date	Revision No.	Author and Approval
8.11.16	1	S. Bolisetty/J. Smyth, A. Ottaway (ACNE/ CNS)
23.9.25 30.10.25	2	S Bolisetty (medical co- director), J Smyth (Staff specialist) Endorsed NCC CBR Committee
8.12.25	2	RHW BRGC

Appendix 1 Comparison of Conventional and NAVA Ventilation

	Conventional Ventilation	NAVA Ventilation
Neonate controls	• Ventilator using Flow Trigger • Initiation of breath rate if above set back-up rate	• Ventilator using Edi Trigger • Initiation of breath • Rate of breath • Inspiratory Time • Peak Pressure • Termination of breath
Ventilator controls	• PEEP • FiO_2 • Peak Pressure • Tidal Volume • Inspiratory Time • Minimum breath rate • Breath termination	• PEEP • FiO_2 • NAVA level
Synchrony	• Initiation of breath	• Initiation of breath • Size of breath • Termination of breath

Appendix 2 Edi Catheter

1. Sizes
   - <1000g - 6Fr 49cm (tip is 2.5cm below oesophageal-gastric junction)
   - 1000-1500g – 6 Fr 50cm (tip is 3.5cm below oesophageal-gastric junction)
   - 1000-2000g - 8Fr 50cm
   - >2000g - 8 Fr 100 cm
2. Edi Catheter Components (Picture 4)



Picture 4

Appendix 3 Optimisation of Ventilation using NIV- NAVA

Problem	Cause	Solution
Edi persistently > 15 µV	• Increased WOB • Mechanical blockage of the airway • Prongs/mask malpositioned	• Increase NAVA level by 0.2 increments until Edi is persistently below 15 µV
Edi persistently < 5 µV	• Low WOB	• Consider weaning NAVA level by 0.2 increments
Edi is irregular	• Immaturity • Hyperventilation • Sepsis • Sedation • Deterioration of condition	• Resolve underlying conditions
Edi min consistently > 3µV	• resting activity of the diaphragm high • splinting the diaphragm • crying • pain	• Increase PEEP
Edi catheter won't aspirate	• Edi catheter may collapse if aspirated too quickly	• Use Edi catheter positioning screen to determine correct position
Edi catheter blocked	• Edi catheter has a smaller diameter lumen that can become blocked by thick viscous medications or thickened feeds	• Change Edi catheter
Excessive Leak **Low PEEP Disconnection Alarm**	• Leak is potentially greater than 15L/min (the flow limit of the ventilator)	• Review circuit for disconnections • Review interface and connections to face
Desaturations/Bradycardia	• Suitability of mode of ventilation • Insufficient back up ventilation • Air in stomach • Clinical change in neonate's condition- RDS, Sepsis, IVH, Pneumothorax	• Increase NAVA level • Reduce apnoea time as low as 1sec in 0.2 sec increments • Increase backup PC and rate • Aspirate Edi Catheter/OG tube • Check positions are correct
Gaseous Distension	• Smaller lumen of NG tube and difficulty in aspiration • Air trapping in the gut	• pass a second NG/OGT for aspiration of gas and gastric contents
Sudden increase in Edi peak **on Invasive NAVA**	• ETT blocked • Chest drain blocked • Pain	• Review medical condition
No patient effort (on Edi signal)	• Edi mal-positioned • Over-sedation • Over-ventilation (backup PC rate high) • Extreme Prematurity • Apnoea time too short	• Reduce apnoea time • Adjust the alarm setting (apnoea audio delay) • Check blood gas • Check Edi catheter position

Appendix 4 Troubleshooting of NAVA ventilator

IF YOU EXPERIENCE A PROBLEM WHICH IS DIFFICULT TO SOLVE, TAKE A SCREENSHOT OF THE SERVO-n SCREEN (press the **camera icon on the top right of the screen – this can then be reviewed later or speak with Getinge Support Team)**

Alarm message	Possible causes	Alarm management checklist
Edi signal invalid.	Backup ventilation is active due to invalid Edi signal.	Check catheter position.
Edi signal interference from ECG.	Backup ventilation is active due to interference from the ECG signal.	Backup ventilation is active due to interference from the ECG signal. Check Edi catheter position.
No patient effort.	An apnea has caused the ventilator to switch to backup ventilation.	Check patient. Check ventilator settings.
No consistent patient effort.	The ventilator has switched between supported and backup ventilation four times in two minutes. The patient has only triggered a single breath to interrupt each of two consecutive backup periods.	
Edi module disconnected.	Edi module is not properly inserted.	
Edi module error.	Hardware error in the Edi module.	Replace the Edi module.
Edi catheter error.		Replace the Edi catheter.
Volume delivery is restricted.	The pressure is limited to 5 cmH_2O below the set upper pressure limit.	Check ventilator settings. Check alarm limits.
No Edi catheter connected.	The Edi catheter is not properly connected.	Check Edi catheter connection.
Edi monitoring not active.	NAVA mode is activated when no Edi module and/or Edi catheter is connected.	Change ventilation mode. Insert the Edi module.

Appendix 5 NIV-NAVA Guide

1. Initiation of NIV-NAVA:

- Catheter selection – appropriate size
- Initiate NAVA level 1-1.5 and titrate in 0.2 increments to Edi peak < 15μV
- Target lowest FiO_2 requirements
- Consider PEEP titration

2. Optimising NAVA Level

- Maintain Edi peak < 15μV
  - Edi peak < 5 μV - decrease NAVA level
  - Edi peak > 15 μV - increase NAVA level
- Review neonate's respiratory efforts on the ventilator screen and on Trends/Logs screen
  - Respiratory rate spontaneous and supported,
  - amount of Back-up PC (no. and %),
  - Edi peak and min
- Ensure adequate oxygen saturations
- Monitor at frequency of desaturation on Trends and bradycardic episodes

3. Optimising Backup PC

- Check that Pressure above PEEP is achieving adequate chest movement
- Check blood gases once settled on NIV-NAVA
- Set respiratory rate (Back-up PC) according to needs (desaturations, pCO_2 and ABG)
- Set Apnoea time to reduce frequency of desaturations and bradycardic episodes

If back up ventilation is too high infant will not be encouraged to breathe spontaneously consistently this may be identified by frequency of back up and % time in backup.

4. Weaning

- Stable, low FiO2 requirement
  Hemodynamically stable
- Regular respiratory rate
- Edi is regular and peak < 5 μV

5. Options for weaning

- Apnoea Time up to 2-3 sec
- Back-up RR to 40/min
- Pressure above PEEP
- NAVA level 0.2 at a time
- NAVA level of 0 is tolerated
- nCPAP/ high flow

Always watch for possible deterioration

- Be prepared for escalation of therapy.
- Potential signs of Deterioration:
  - Increased Edi variability
  - Increasing FiO_2 requirements
  - Bradycardias
  - Haemodynamic variations
  - Increasing backup ventilation (PC) %
  - Number of backups/min