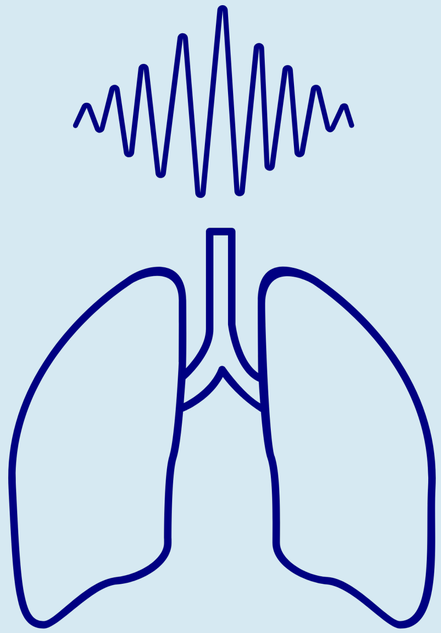
Confederation of Respiratory Critical Care Trials
CoReCCT

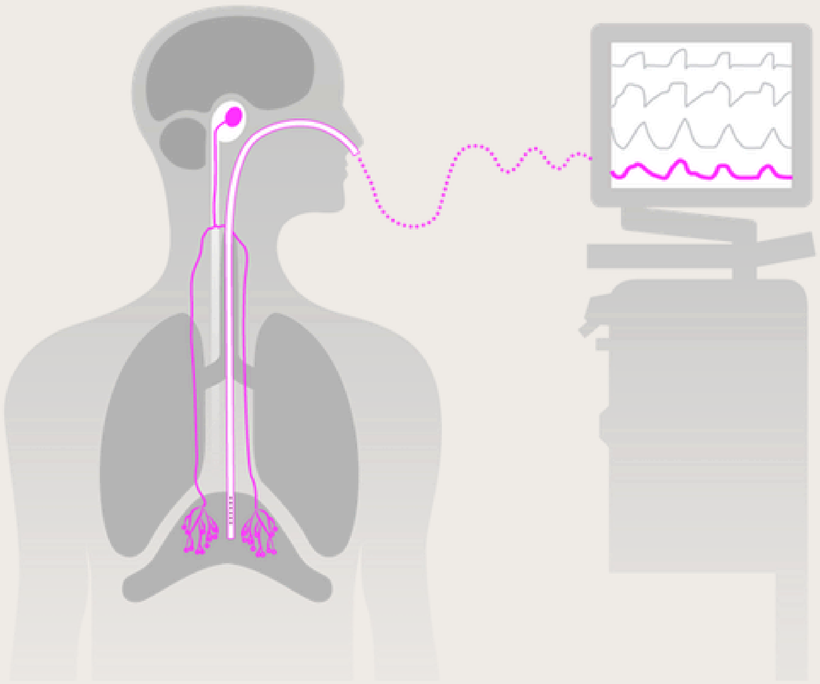


UK NAVA

NAVA TECHNOLOGY INTERVENTION TRAINING EXTENDED SLIDES

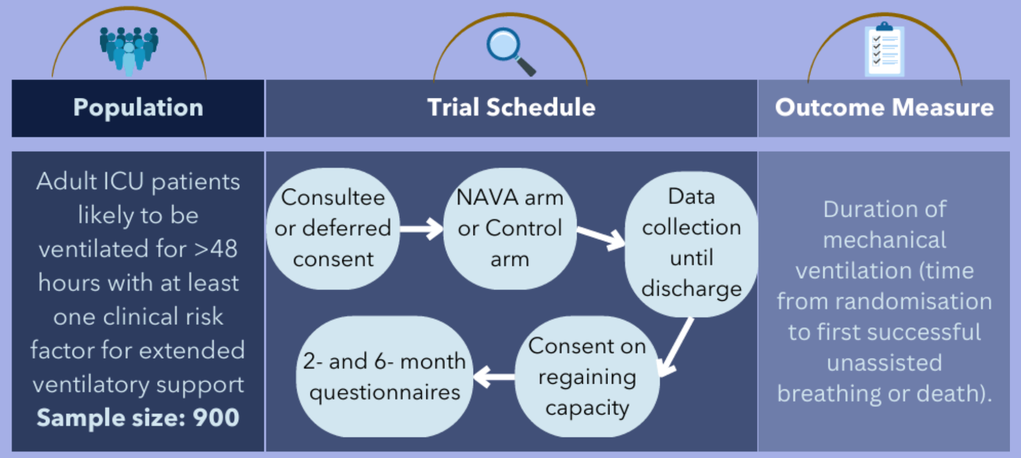
UK NAVA 2026

AGENDA



- TRIAL DESIGN
- NAVA CATHETER
- VENTILATION OVERVIEW & NAVA TECHNOLOGY
- VIDEOS
- USING NAVA TECHNOLOGY IN PRACTICE
- FLOWCHARTS
- ADDITIONAL SLIDES

UK NAVA TRIAL OVERVIEW



UK NAVA TRIAL DESIGN

Inclusion Criteria

- Adult patients
- Likely to remain ventilated > 48 hours from randomisation
- Acute or chronic medical reason why weaning may be extended*

*For guidance, acute clinical risk factors would include pneumonia, ARDS, septic shock, multiple organ failure, acute pancreatitis. Chronic risk factors would include history of heart failure, COPD, obesity. Patients should not be included if they are solely being kept ventilated whilst awaiting imaging, a procedure, after drug overdose or awaiting a test result.

Exclusion Criteria

- Unlikely to survive <24 hours
- Receiving end-of-life care
- Contraindication to nasogastric or orogastric tube
- Severe brain injury including brain-stem damage or hypoxic brain injury or requirement for neuroprotective ventilation
- Spinal cord injury above C6 or phrenic nerve injury including Guillain Barre and Myaesthenia gravis
- Home ventilation or referred/accepted for long-term ventilation unit care
- Known/suspected portal hypertension
- Temporary or permanent pacemaker

WHY UK NAVA? THE CURRENT RESEARCH ↓

NAVA MODE IMPROVES THE SYNCHRONY BETWEEN THE VENTILATOR SUPPORT AND THE PATIENT'S BREATHING ACTIVITY

Pettenuzzo, T., et al., 2019

PHYSIOLOGICAL REGULATION AND PULMONARY REFLEX MECHANISMS PREVENT HIGH TIDAL VOLUMES AND FACILITATE LUNG-PROTECTIVE VENTILATION

Jonkman, A.H., et al., 2019

NAVA GROUP HAD A GREATER NUMBER OF VENTILATOR FREE DAYS 22 VS. 18 DAYS

Kacmarek, R.M., et al. 2020

MORE VENTILATOR FREE DAYS TO DAY 28, RASS SCORES CLOSER TO 0

Hadfield, D., et al., 2020

BELIEF THAT NAVA IS SAFE AND CLINICALLY EFFECTIVE BUT LOW CONFIDENCE AND A PERCEPTION OF TECHNICAL DIFFICULTY. STRONG SUPPORT FOR FUTURE RESEARCH!

Hadfield, D., et al., 2020

THE TRIAL ADDRESSES THE JAMES LIND ALLIANCE ICU PRIORITY SETTING PARTNERSHIP, QUESTION; 'WHAT IS THE BEST WAY OF PREVENTING LUNG DAMAGE OF PATIENTS RECEIVING RESPIRATORY SUPPORT?'

Reay, H., N. Arulkumaran, and S.J. Brett, 2014

1/3 OF PATIENTS EXPERIENCE DIFFICULTIES WHEN REDUCING SUPPORT (WEANING), CAUSING A PROLONGED DURATION OF INVASIVE MECHANICAL VENTILATION

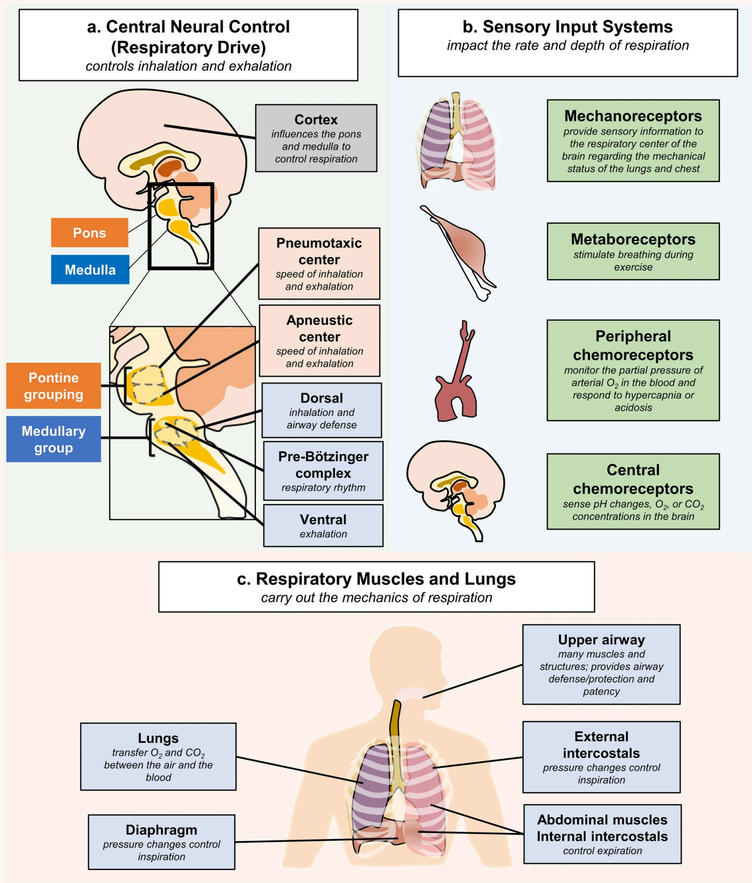
Béduneau, G., et al., 2017

IN PATIENTS DIFFICULT TO WEAN, NEURALLY ADJUSTED VENTILATORY ASSIST DECREASED THE DURATION OF WEANING AND INCREASED VENTILATOR-FREE DAYS

Liu, L., et al., 2020

THE QUESTION... WILL NAVA TECHNOLOGY DECREASE THE TIME PATIENTS SPEND ON VENTILATORS WHEN THEY HAVE RISK FACTORS FOR EXTENDED WEANING?

WHAT IS NAVA? ↓ NEURALLY ADJUSTED VENTILATORY ASSIST



NAVA CATHETER

- Enteral feeding tube with electrodes.
- EDi signal acquisition and optimisation.
- Enables clinical team to view electrical diaphragm activity (EDi).

NAVA TECHNOLOGY

NAVA MONITORING

- Can be used to optimise ventilation in any mode.
- Hourly EDi signal monitoring.
- Review trends on Servo-u.
- Documentation!

NAVA MODE

- Spontaneous breathing ventilation mode.
- Proportional and synchronous pressure support, controlled and triggered by the EDi signal.

NAVA CATHETER

NAVA CATHETER ↓



NEX =
Bridge of NOSE,
EAR LOBE,
XIPHSTERNUM

Functions like a standard enteral tube.
Can be inserted NG or OG.
Can administer;
- enteral feed & fluids,
- medication,

& monitor gastric volume.
Pre-lubricated, use water to activate.

Any healthcare professional authorised to insert a standard enteral tube under your local policy is also qualified to insert a NAVA Catheter.

Confirm placement following the hospital's enteral feeding tube policy (e.g. X-ray or pH testing).

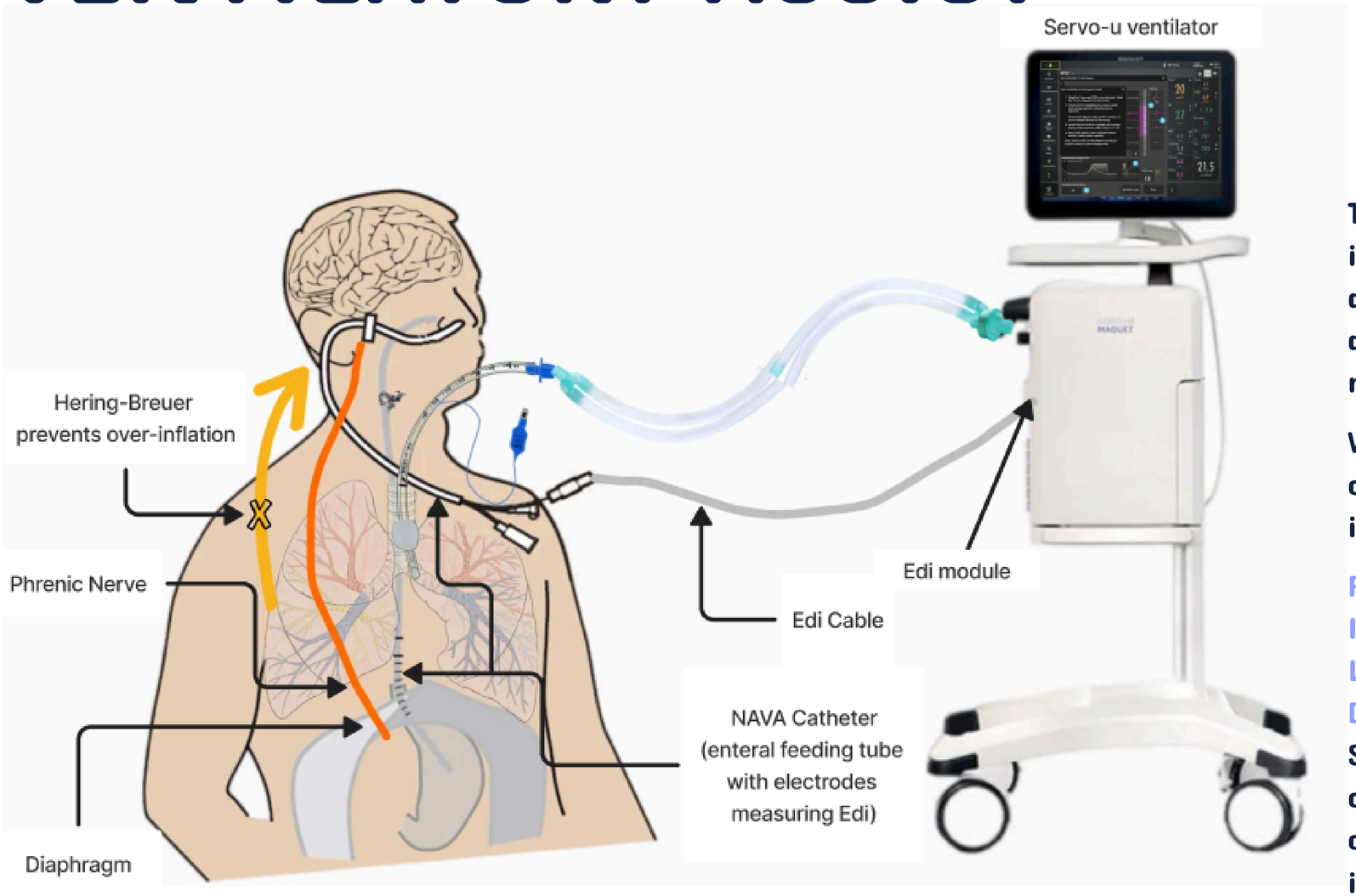
The NAVA Catheter is NOT MRI compatible.
Remove prior to MRI.
Change every 7 days and remove on transfer.

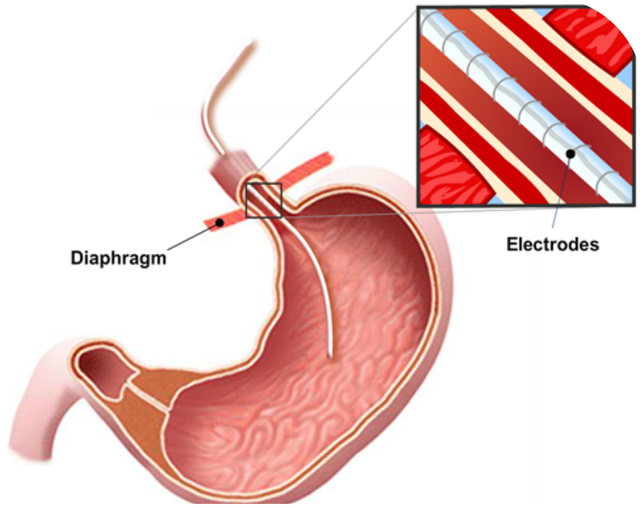
Has electrodes measuring electrical diaphragm activity (EDi) enabling NAVA Monitoring and NAVA Mode.

NEVER use an enteral tube until gastric location is confirmed.
DO NOT use the ECG positioning tool to confirm gastric placement.

VETILATION OVERVIEW & NAVA TECHNOLOGY

NEURALLY ADJUSTED VENTILATORY ASSIST





The electrical activity of the diaphragm muscle (EDi) is continuously measured using a NAVA catheter. This activity can be used as a monitor of patient respiratory drive, allowing optimisation of ventilator settings in any mode.

When the NAVA mode is active, the EDi signal triggers, cycles and adjusts ventilator support within each breath in proportion to diaphragm muscle activity.

Physiological evidence, NAVA mode provides:
Improved patient- ventilator synchrony,
Lung-protective ventilation,
Diaphragm- protective ventilation.
Studies have shown NAVA mode led to a larger contribution of the diaphragm to inspiratory efforts when compared to PSV (Cecchini, 2014). The distribution of air in the lungs when a patient is in NAVA mode aligns more to a non-ventilated person (Blankman, et al. 2013).

NAVA TECHNOLOGY DEFINITIONS

EDipeak

EDipeak

Reflects the highest electrical activity of the diaphragm muscle contraction(measured in µV). Therefore it can be seen as a surrogate of the patient's drive to breathe.

EDi peak for most patients is between 5 – 20 µV.

**In patients with COPD, other chronic pulmonary diseases or with acute lung injury,
EDi peak may be higher than 20 µV.**

Document EDi peak hourly!

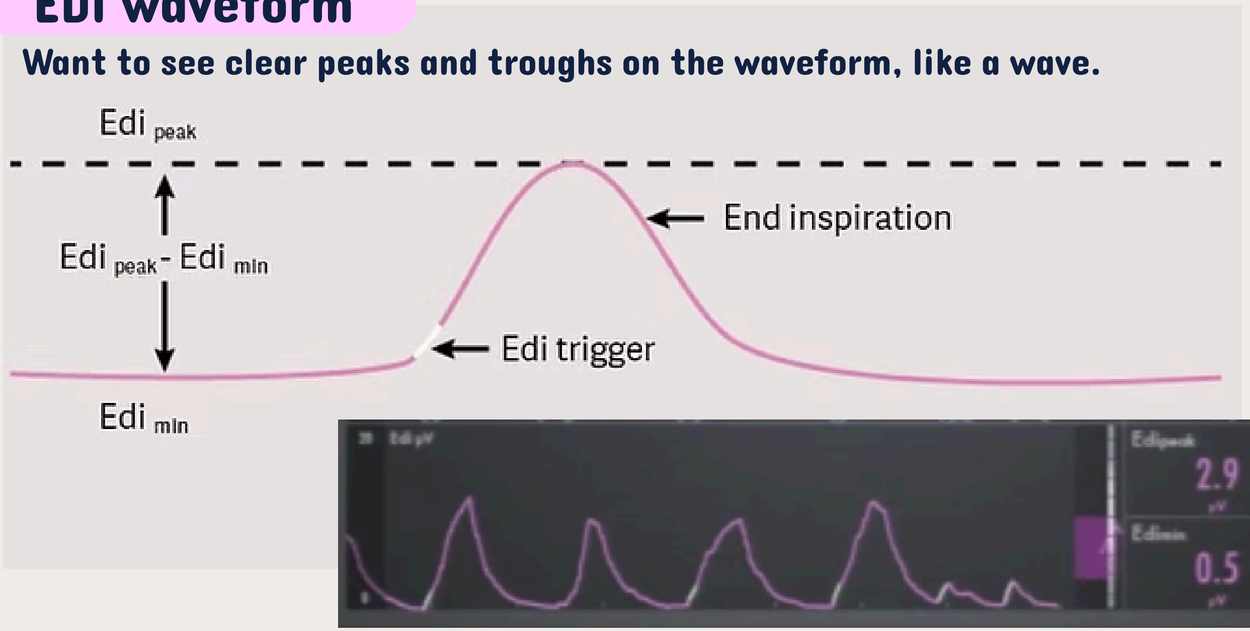
EDimin

EDimin

Electrical activity of the diaphragm between inspiratory efforts (measured in µV).

EDi waveform

Want to see clear peaks and troughs on the waveform, like a wave.



**The EDi waveform will be displayed on the screen.
The EDipeak and EDimin will be displayed as numeric values.**

Optimising EDi waveform

- **Switch to spontaneous modes**
- **asking the patient to take a deep breath,**
- **sedation reduction,**
- **ventilation support reduction,**
- **or expiratory breath hold.**

HOW DOES NAVA MODE DIFFER TO STANDARD PRESSURE SUPPORT?

FLOW OR PRESSURE TRIGGER VS. NEURAL TRIGGER

Central nervous system

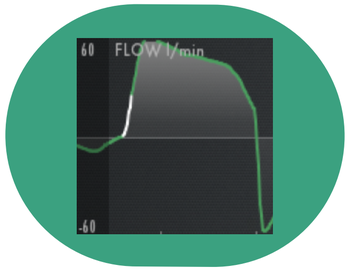
Phrenic nerve



Diaphragm excitation

Diaphragm contraction

Chest wall and lung expansion



Airway pressure, flow and volume

Neural trigger

Ventilator

Flow or
pressure trigger

Assisted
breath

How much does our breathing pattern change?



Lovely, relaxing Fiji



AH! Voldemort, bit scary

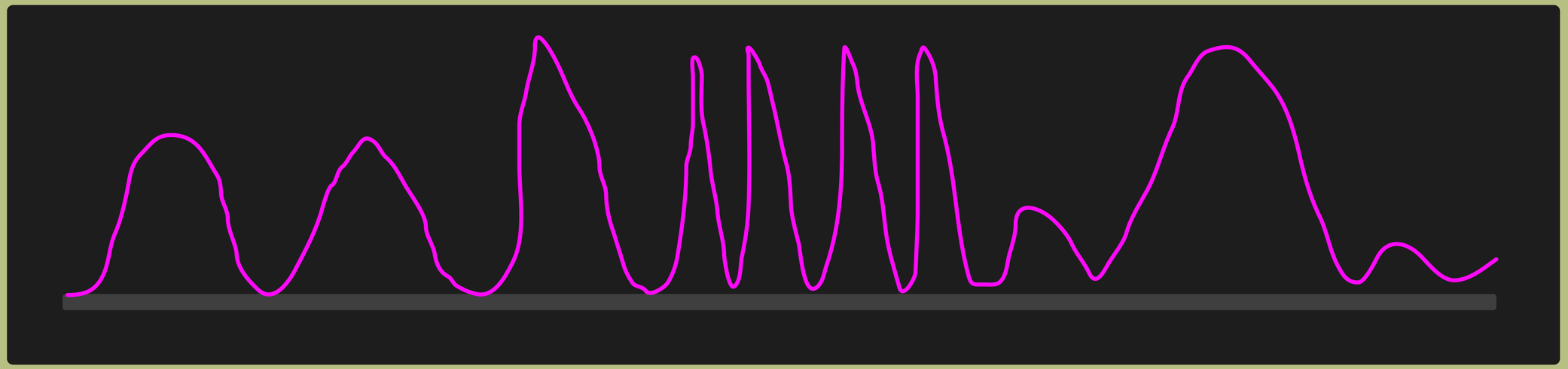


Exercising



Sleepy, Yawning

Our electrical diaphragm activity (EDi) would likely look like...



Do our current standard ventilation modes account for these changes?

NAVA MODE,
KEY DIFFERENCES TO PRESSURE SUPPORT MODE

Proportional assistance

The level of pressure (NAVA level) is proportional to the patient's diaphragm activity (EDi). This ensures better adaptation to the patient's needs.

Trigger and cycle mechanism

Instead of traditional flow or pressure triggers with a pre-set cycle, NAVA Mode uses the EDi signal as the primary trigger and to cycle the breath.

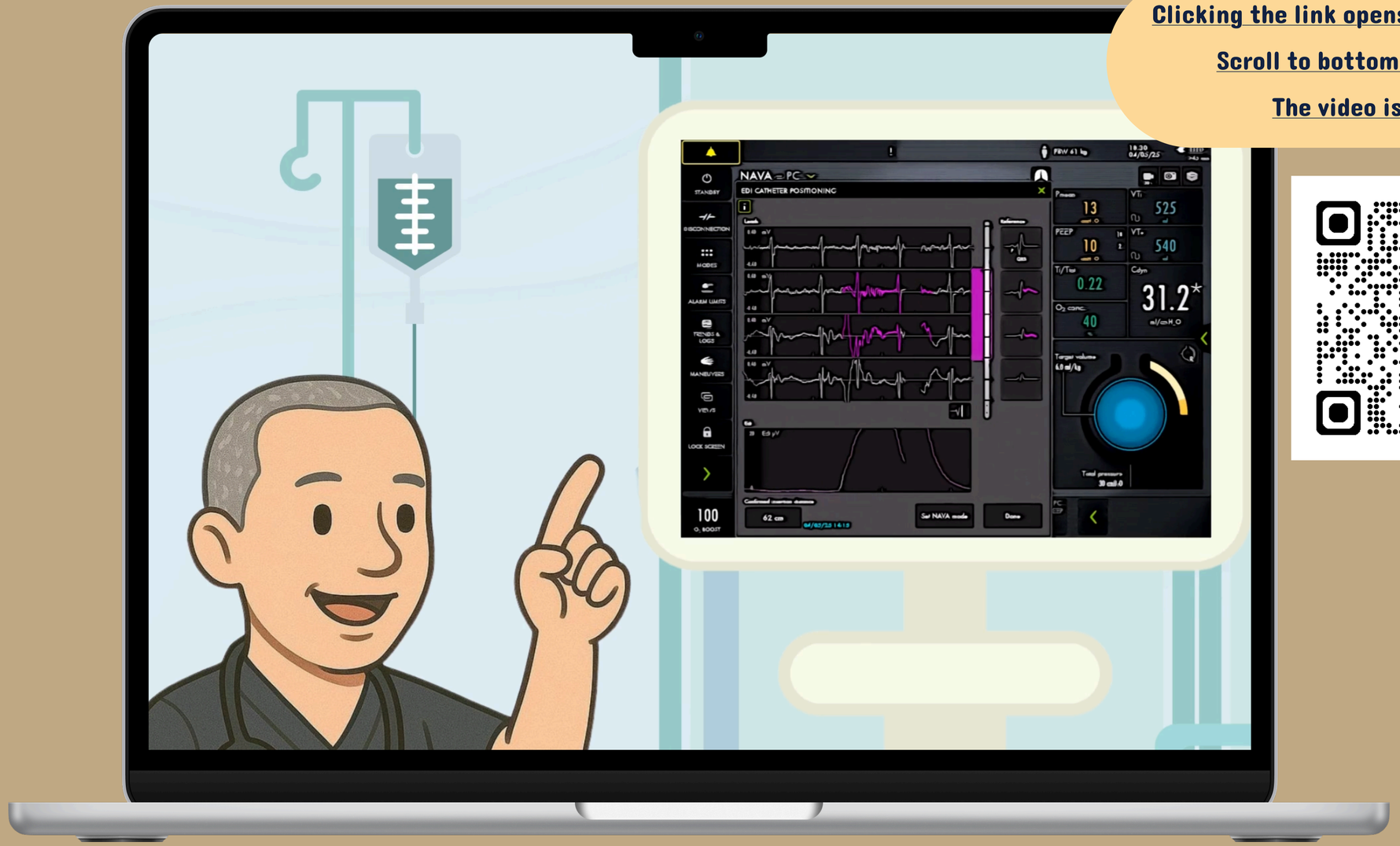
Backup triggers

Safety, comfort and optimal support.

Trigger sequence is:
Edi (primary trigger) >
Flow or Pressure (backup triggers) >
Mandatory Mode (ultimate backup)

VIDEOS

CLICK HERE TO WATCH STAFF VIDEO



Clicking the link opens warwick website.

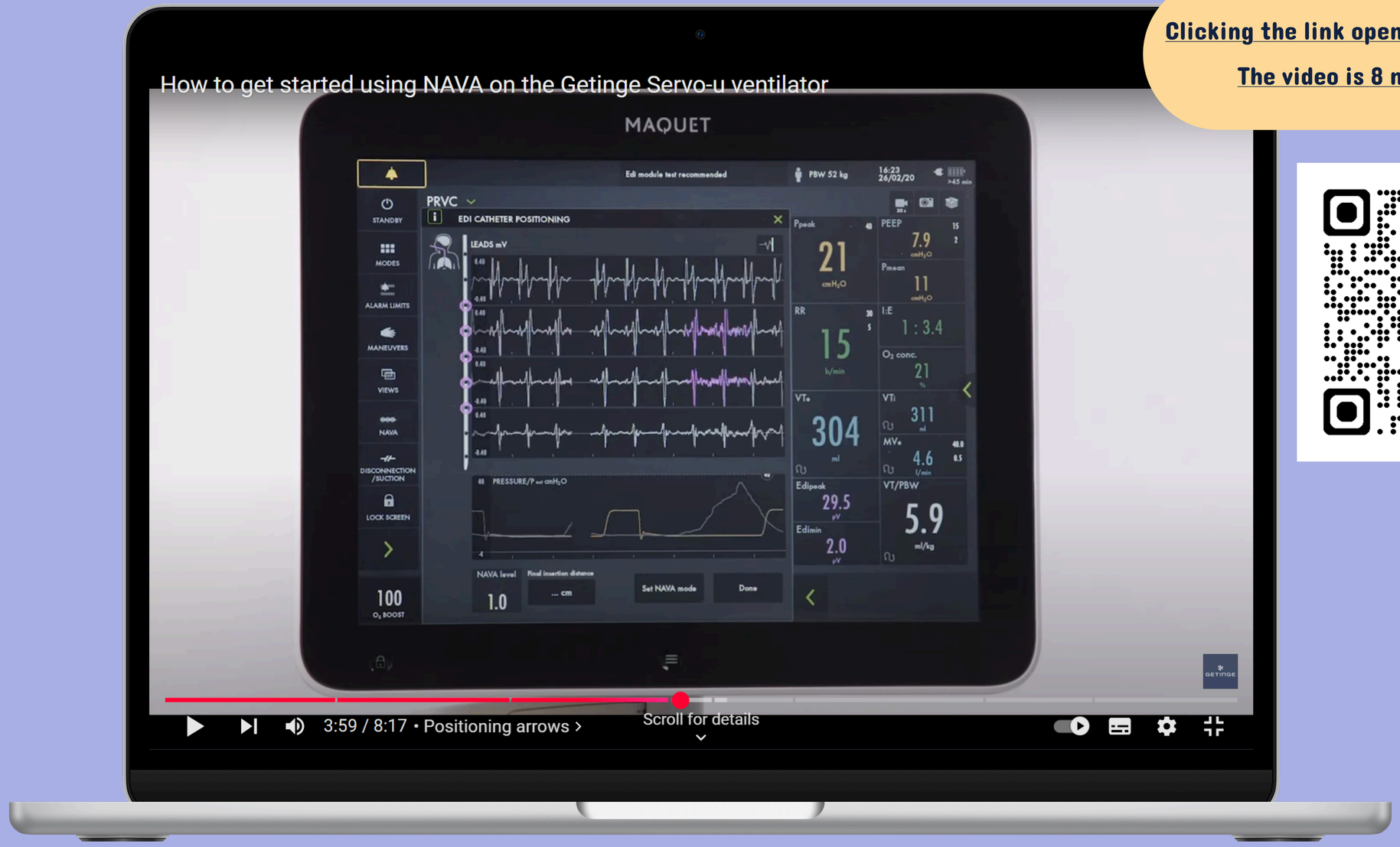
Scroll to bottom of the page.

The video is 8 mins.

CLICK HERE TO WATCH SET UP VIDEO

Clicking the link opens youtube.

The video is 8 mins.



USING NAVA TECHNOLOGY IN PRACTICE

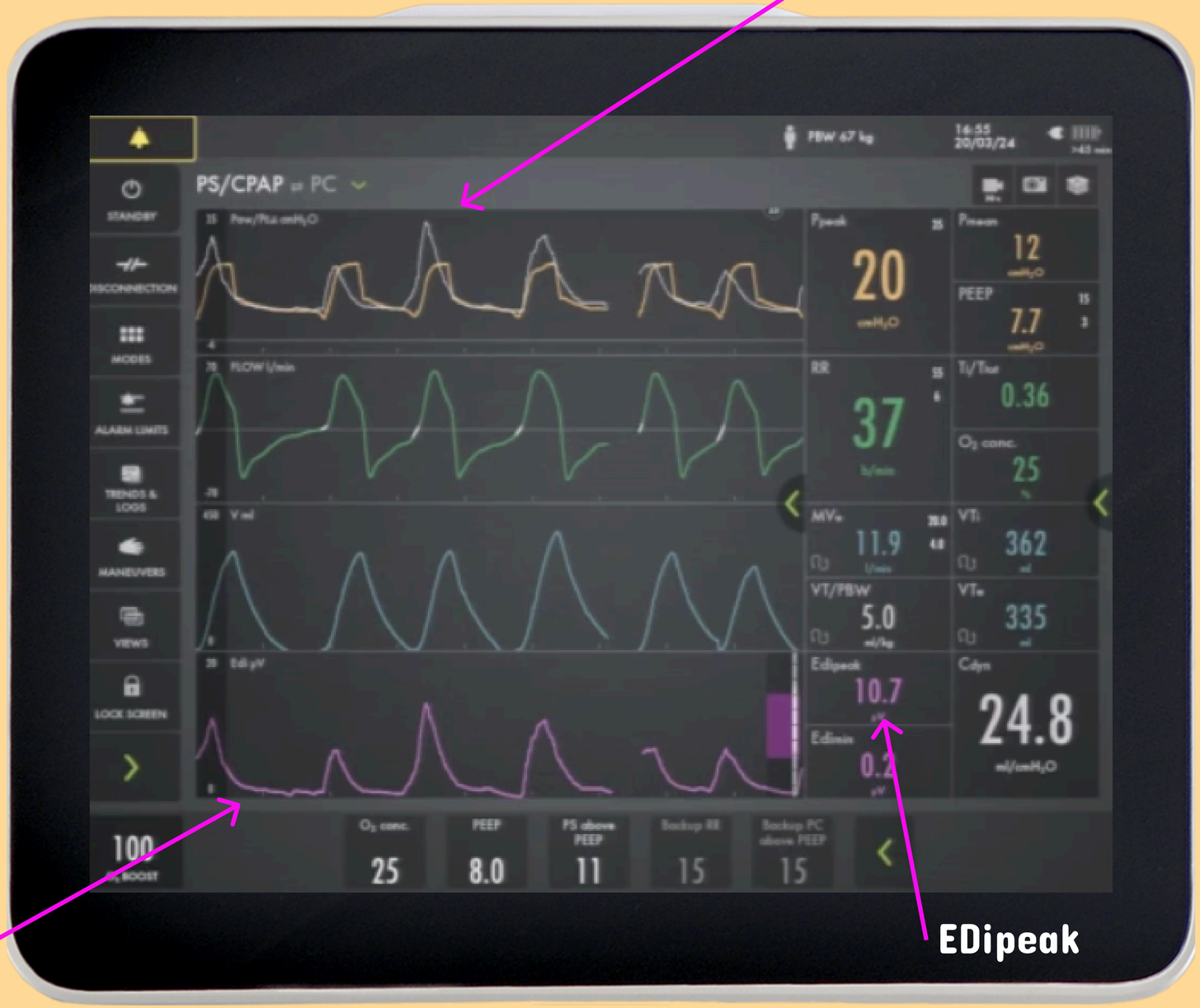
NAVA MONITORING

pEDi waveform (in white) overlaid on current Mode

What does NAVA Monitoring do?
Inform patient treatment by establishing;

- The patients changing respiratory effort over time.
- Supports visual examination.
- If the patient's breathing pattern is synchronised with the ventilator support.
- Can be used in all modes and standby.

All patients randomised to the NAVA technology intervention arm, should receive NAVA Monitoring.
If they do not there should be a documented clinical reason.



EDi waveform

EDipeak

NAVA MODE

What does NAVA Mode do?
NAVA Mode delivers pressure support that is proportional and synchronous to spontaneously triggered breaths.

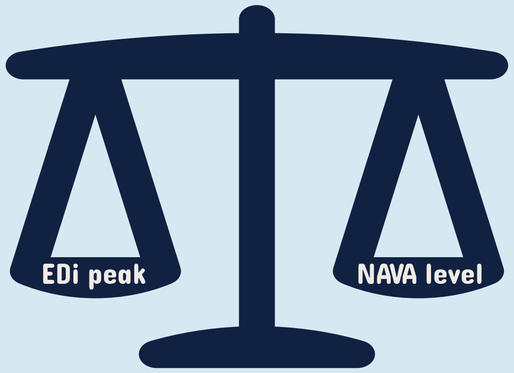
All patients randomised to NAVA technology, should receive NAVA Mode, if there is appropriate EDi signal and waveform.
NAVA Mode should be assessed and trialled at least once every 24 hours, i.e. at ward round.
Document the clinical outcome or decision.

Clinical team set the NAVA level...
Helpful simplification:
If NAVA level = 1.0 $cmH_2O/\mu V$.
If EDi peak = 8μV
Equivalent PS breath = 8 x 1 = 8 cmH2O

pEDi waveform cannot be overlaid in NAVA Mode



INCREASING AND REDUCING SUPPORT



Titrate according to;

- **Tidal volume** aiming for 6-8ml/kg predicted body weight
- **Respiratory rate** though, may be higher e.g. 15-35bpm in NAVA mode
- **A visual assessment of breathing and patient comfort**
- **Monitor for cardiovascular stability, desaturation, increased work of breathing, or tachypnea.**

Titrating/ optimising NAVA Mode

Weaning and increasing support

Optimise NAVA level in steps of 0.1 – 0.2 $cmH_2O/\mu V$.
As with standard weaning you can decrease NAVA in sprints, or gradual reduction over time and alongside CPAP sprints.

As with all modes, the inspiratory pressure of a breath will not exceed 5 cmH20 below the upper pressure limit.

Regularly review trends in the Servo-u to have a better understanding of ventilation including average EDi peak over a minute.

Alarm settings & trends

FLOWCHARTS

NAVA CATHETER INSERTION

STOP & CHECK

Randomised?

- Confirm the patient is enrolled in the UK NAVA trial
- Ensure allocation to the NAVA technology arm

When?

- Insert NAVA catheter within 6 hours of randomisation
- If reinserting; at a time that is appropriate for both patient & team

Who can insert?

- ICU clinical staff permitted to insert standard NG/OG tubes

Equipment

- Servo-u ventilator
- EDi module (non-disposable)
- EDi cable (non-disposable)
- NAVA catheter (single use)
- Water (to activate lubcricant, no other lubricant)
- Tape measure (included in NAVA catheter box)

Adult NAVA catheter sizes

Further guidance on box, exercise clinical discretion

12 Fr: patient height 75-160 cm (2' 6" - 5' 3")
16 Fr: patient height >140 cm (4' 7")

Gather equipment & select NAVA catheter size

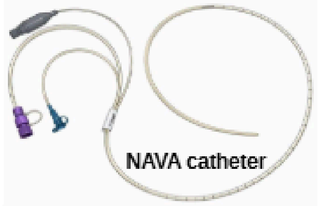
Module Test

1. Connect the EDi cable to the EDi module
2. Connect other end to the cable test port
3. The test starts automatically
4. Proceed if; '**EDi Module Test passed**' is displayed

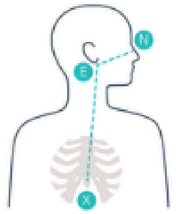


EDi module

EDi cable



NAVA catheter



NEX measurment

Estimate Insertion Depth

On the Servo-u interface, select:

1. '≡' (left of screen)
2. '**EDi & NAVA**'
3. '**EDi Catheter Insertion**'
4. Using tape measure, measure NEX (Nose (bridge) → Ear lobe → Xiphisternum)
5. Enter NEX and other information into the '**calculation tool**' to obtain an estimated insertion distance

Catheter Insertion

1. Dip tip in water (activates lubrication)
2. Insert to the estimated insertion distance
3. Connect to the ventilator via the EDi cable

Gastric position MUST be confirmed using local policy

4. Select '**EDi Catheter Positioning**' on ventilator

Fine tune for optimal catheter position *see reverse page*

Tips & Reminders

- Double-check NEX measurement with a colleague
- If reinserting a catheter of the same size and previous EDi trace was good, consider using the previous insertion depth
- Gastric position MUST be confirmed using local policy

Look at the EDi Trace, is it a **wave**form of is it flat?

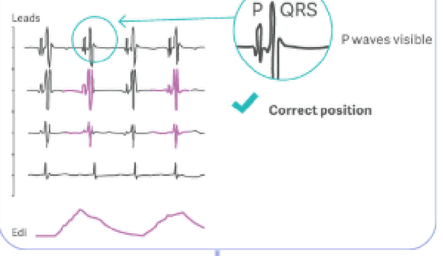
WAVEFORM

Fine tune using the positioning window

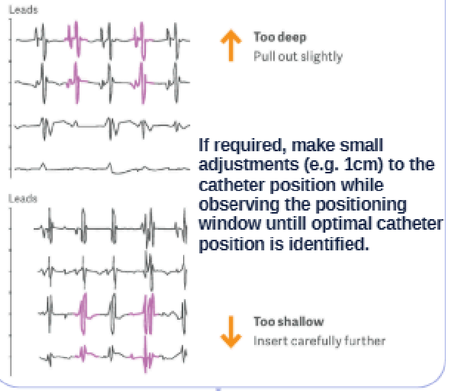
Optimal catheter electrode position is indicated by:
a. Large ECG at top reducing to small ECG at bottom
b. Purple highlighted ECG in 2 and 3 (middle) traces

Read the screen and look at the arrows to identify this. Some movement between the ECG trace is normal.

Positioning Window



Re-positioning



If required, make small adjustments (e.g. 1cm) to the catheter position while observing the positioning window untill optimal catheter position is identified.

Optimal electrode position indicated?

1. Secure NAVA catheter
2. Enter the final insertion distance into the positioning window
3. Verify the position regularly, i.e. handover/ safety checks

FLAT

Do not fine tune using the positioning window

Remeasure NEX

Advise to check measurement with a colleague

Different measurement?

1. Update '**EDi Catheter Insertion**' to obtain a new estimated insertion distance
2. Change catheter position in patient accoringly to new estimated insertion distance

Same measurement?

1. Secure NAVA catheter at estimated insertion distance
2. Enter distance into the positioning window

Optimise EDi waveform

If it is clinically appropriate, increase respiratory drive by:

- Reducing sedation
- Reducing ventilatory support
- Switching to spontaneous mode
- Asking the patient to take a deep breath or perform an expiratory breath hold

Reasses EDi trace

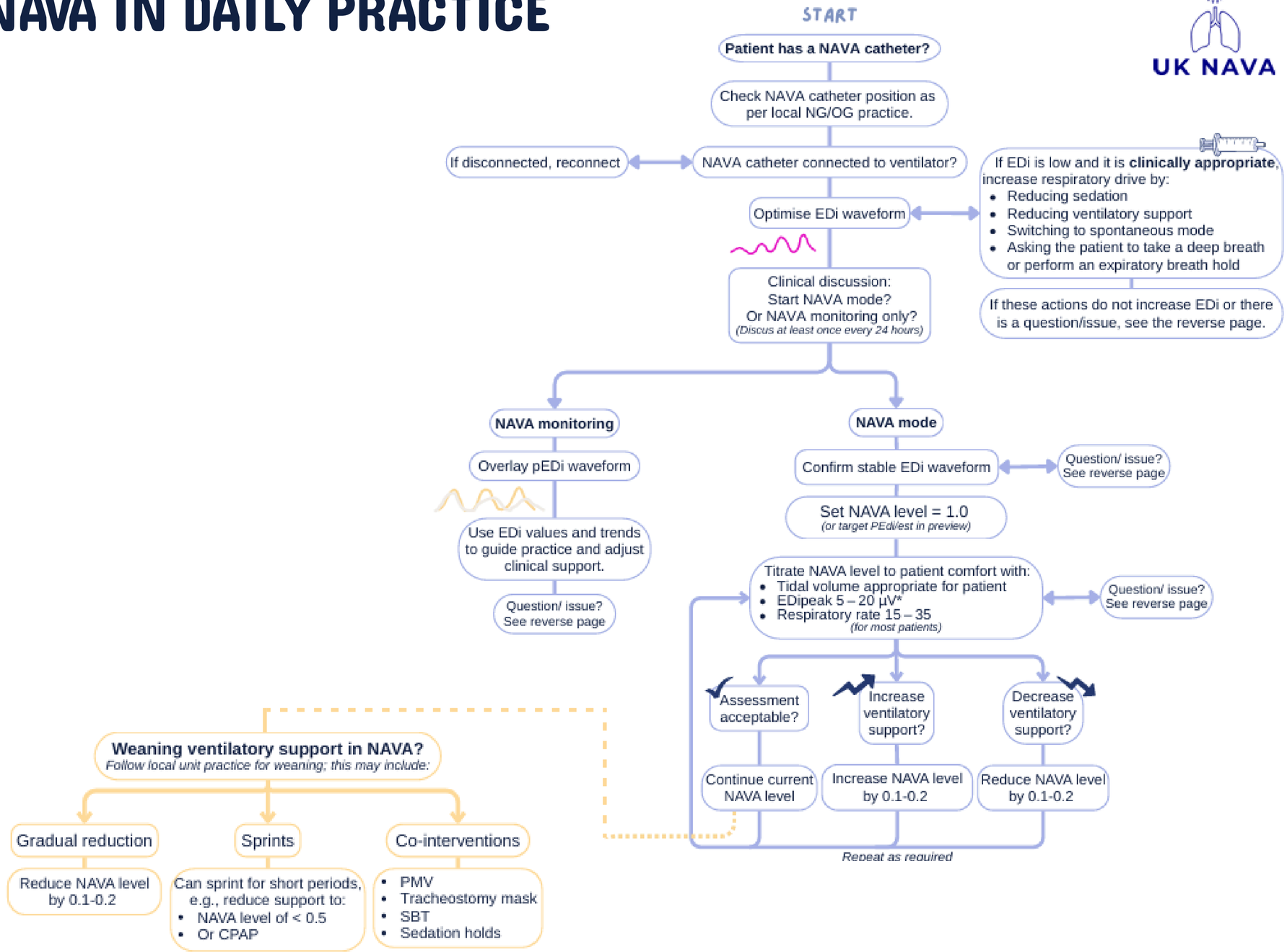
Tips & Reminders

- If the waveform is noisy, there is an issue, or optimisation does not increase EDi, see troubleshooting flowchart
- Gastric position MUST be confirmed using local policy
- If using x-ray to confirm gastric location, include in request for NAVA catheter NG confirmation

Contact UK NAVA Team for Support

NAVA@warwick.ac.uk
www.uknava.com
Online training: https://corecct.learnprouk.com

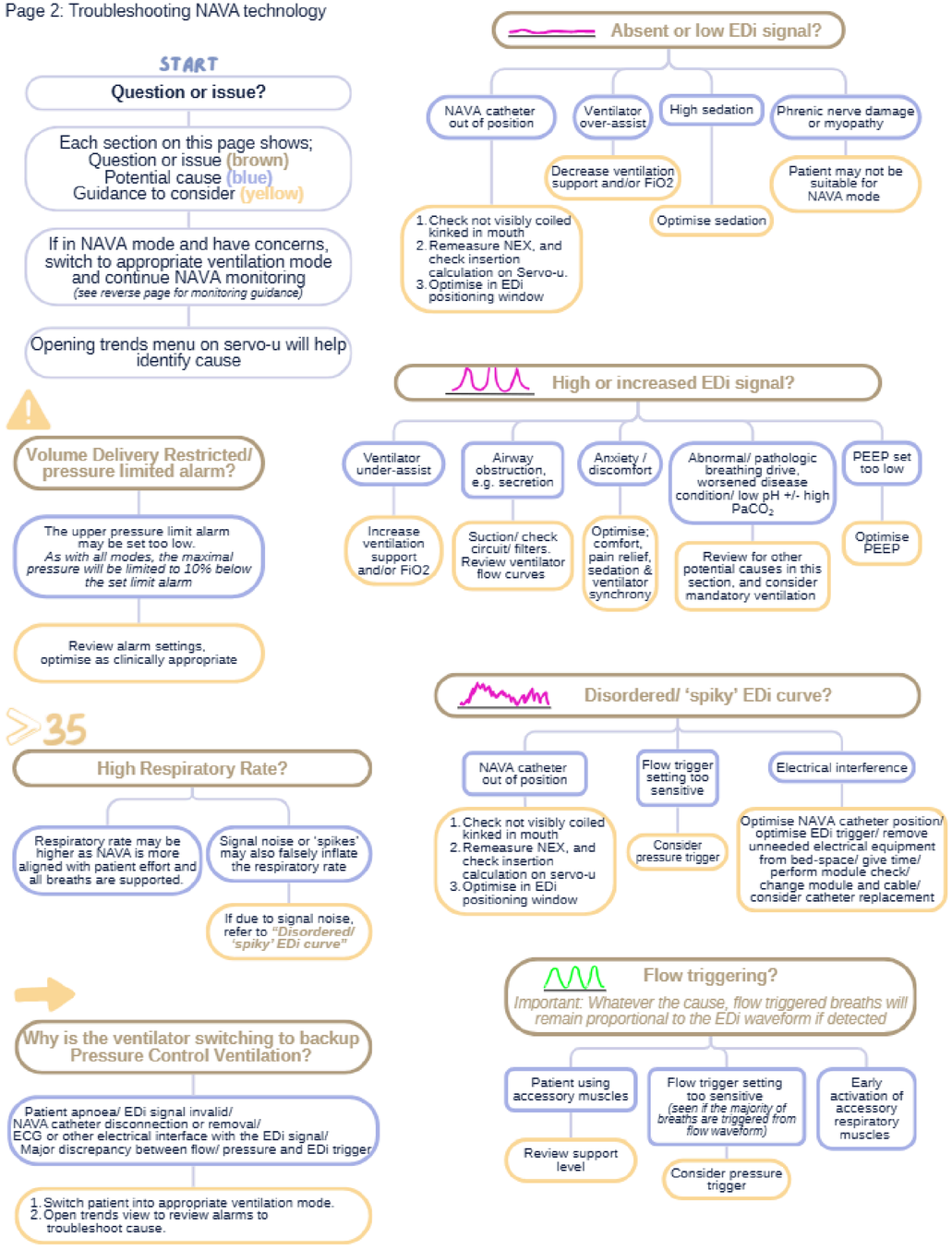
USING NAVA IN DAILY PRACTICE



TROUBLESHOOTING

NAVA Technology Clinical Flowcharts

To support practice and troubleshooting
Page 2: Troubleshooting NAVA technology



ADDITIONAL SLIDES

P 0.1

SERVO-U INTERFACE

OPTIMISING & TROUBLESHOOTING NAVA TECHNOLOGY

FURTHER READING

FURTHER SUPPORT

P 0.1
AIRWAY OCCLUSION PRESSURE

P 0.1 – AIRWAY OCCLUSION PRESSURE DURING 100 MS DYNAMIC MEASUREMENT

DOCUMENT ONCE DAILY AT 8AM

P 0.1 measures the patient´s inspiratory effort during spontaneous breathing and represents the airway pressure generated during the first 100 ms of an inspiration against a closed or occluded airway.

In patients with obstructive lung disease or acute respiratory failure, P 0.1 is a useful indicator of their ability to be weaned from mechanical ventilation.

Servo-ventilators measures P 0.1 without a manual occlusion maneuver in order to minimize the patient´s discomfort.

All triggered breaths are measured, which takes an average measurement over the last 8 breaths.

P 0.1 is continuously calculated and displayed on the screen.

Normal P 0.1 value is

1.0 - 3.5 cmH_2O

Select R green arrow on servo- u screen to see values such as EDipeak average and P.01

SERVO-U INTERFACE

SERVO-U INTERFACE, NAVA MONITORING



Opens;
‘EDi Catheter Insertion’
‘EDi Catheter Positioning’

‘Trends & Logs’

EDi waveform

Select L green arrow to view; EDi & NAVA menu

NAVA monitoring only
Press and hold on yellow pressure wave form;
select ‘Overlay’ > ‘PEDi’

Select R green arrow to view; ‘EDipeak average’ & ‘P 0.1’

Opens;
‘EDi Catheter Positioning’

EDipeak

EDI CATHETER – CALCULATION TOOL



1. Enter the the Catheter size.
2. Enter NEX
3. Enter if NG or OG
4. Insertion distance displayed
5. Open Edi catheter positioning window

NAVA CATHETER FINE TUNING



A positioning arrow pointing downwards indicates the catheter should be inserted further

NAVA Catheter too deeply inserted – withdraw slightly



This fine tuning tool can only be used why the patient has an EDi waveform. Correct positioning using the positioning window should be verified as part of shift safety checks and prior to commencing NAVA Mode.

SERVO-U INTERFACE - VIEWING TRENDS & EVENTS



Drag the cursor and note that each event/changes have been trended.

Tap 'Organise Trends' to change the order of the trends.

Change the trend scale to 1 hour. Note: Trend values are stored every 60 seconds and retained for a maximum of 72 hours.

SERVO-U INTERFACE - VIEWING TRENDS & EVENTS



1. Drag and drop trends to the order you would like (it will then stay like this)

2. Close the window by tapping green cross.

STOPPING VENTILATION

It is possible to continue EDi monitoring when the ventilator is in standby. Simply select; EDi Monitoring.
This is useful for patients who may be having trachy mask trials or following extubation. Please note this is not mandated in the UK NAVA protocol.





OPTIMISING & TROUBLESHOOTING NAVA TECHNOLOGY

WHERE TO START OPTIMISING & TROUBLESHOOTING?

NAVA Mode is just a form of Pressure Support.

That means good, critical care assessment & practice remains the same.

A-E assessment is where to begin when optimising or troubleshooting NAVA Technology.
Patients will still require; suctioning/ cough assist/ HME changes/ have pain.

A-E Assessment

STOP concerned?

Is the clinical team concerned? OR are you concerned from the information that has been relayed or you can see?

Patient safety is priority, clinical teams should always choose the most appropriate ventilation mode for that patient.
NAVA Monitoring should always be continued.

Question or issue

HIGH RESPIRATORY RATE ➜

Potential cause	Guidance to consider
• Respiratory rate may be higher as NAVA is more aligned with patient effort and all breaths are supported. • Signal noise or 'spikes' may also falsely inflate the respiratory rate.....	If due to signal noise, refer to guidance below.

EXAMPLE: Missed breaths clearly visible in patient when ventilated in Pressure Support Mode

ACTIONS: RR in PS is 14. When changed to NAVA, RR increased but only because now not missing efforts, therefore no 'Actions' needed, as is acceptable.

Example A



Missed efforts clearly visible in patient when ventilated in Pressure Support Mode

NAVA MONITORING CASE STUDY

Monitoring a patient with severe global muscle weakness in pressure support to look at neural drive asynchrony - missed breaths are visible. When the patient was placed in NAVA, the respiratory rate appeared to increase but this was due to resolution of the missed breaths- in NAVA mode all breaths were supported and each pressure support breath was mapped to the neural drive.

Very common, Respiratory Rate in NAVA Mode 15-35 bpm

Question or issue

ABSENT OR LOW EDI SIGNAL

Potential cause	Guidance to consider
• Ventilator over-assist?	Decrease oxygen and/or ventilation support
• High sedation?	Optimise sedation
• NAVA catheter out of position?	Remeasure NEX, optimise in EDi positioning window
• Phrenic nerve damage or myopathy?	Patient may not be suitable for NAVA mode

EXAMPLE

CAUSE: NAVA Catheter out of position
ACTIONS: Remeasured NEX & optimised in EDi Positioning Window.

BEFORE



DURING



AFTER



NAVA MODE CASE STUDY

Patient with cardiac failure and muscle weakness, had low neural drive when Edi catheter placed. The low neural drive signal gave an unreliable location. Occasional ECG strikes could be seen indicating catheter not actually in far enough. Advanced 5 cm from 65cm to 70cm and neural drive became immediately clear. The patient was then placed in NAVA without difficulty-the initial NAVA level was set against the existing pressure-support breath. This highlighted the importance of considering neural catheter position if drive appears flat. It also highlighted that if the neural drive signal is flat, occasional pink strikes on ECG positioning tool, may be unreliable, perhaps originating from background.

Reasonably common particularly when initially inserted.
Easy to incorrectly measure NEX.
Recommend checking NEX measurement with a colleague.

Question or issue

ABSENT OR LOW EDI SIGNAL

Potential cause	Guidance to consider
• Ventilator over-assist?	Decrease oxygen and/or ventilation support
• High sedation?	Optimise sedation
• NAVA catheter out of position?	Remeasure NEX, optimise in EDi positioning window
• Phrenic nerve damage or myopathy?	Patient may not be suitable for NAVA mode

EXAMPLE

CAUSE: Ventilator over-assist
ACTIONS: Changed to NAVA (spont mode)
= Reduced Ventilation Support

BEFORE



In Pressure Control

AFTER



In NAVA (spontaneous mode)

NAVA MONITORING & MODE CASE STUDY

Patient with ARDS - ventilating in pressure control. The ECG positioning tool was checked. Then NAVA was established and neural drive increased as respiratory load being delivered by ventilator was reduced. Very easy transition: no issues reported by bedside nurses.

Common. Simple to resolve by reducing vent support/ switching to spontaneous mode. 'Normal' EDi peak 5-20μV.

Question or issue

ABSENT OR LOW EDI SIGNAL

Potential cause	Guidance to consider
• Ventilator over-assist?	Decrease oxygen and/or ventilation support
• High sedation?	Optimise sedation
• NAVA catheter out of position?	Remeasure NEX, optimise in EDi positioning window
• Phrenic nerve damage or myopathy?	Patient may not be suitable for NAVA mode

EXAMPLE

CAUSE: Ventilator over-assist
ACTIONS: Reduced PS = Reduced Ventilation Support

BEFORE



In Pressure Support (PS = 9)
Flat EDi trace as over supported with PS of 9

AFTER



In Pressure Support (PS = 4)
By reducing PS, able to now see EDi waveform with peaks of 12

NAVA MONITORING CASE STUDY

This patient in multiple organ failure with a tracheostomy and global sarcopenia related to prolonged critical illness. The NAVA catheter was placed uneventfully. At 9 of pressure support the neural drive is relatively flat patient likely a little over sedated and over oxygenated as well. When the pressure support is reduced, the neural drive to diaphragm is restored. This disappears again as the pressure support is increased again. It proved relatively straight forward to decrease pressure support and transition the patient to NAVA with consequent acceleration of weaning. Essentially the neural drive monitoring was prompting good standard ICU practice of sedation holds and spontaneous breathing trials.

Common.
Simple to resolve by reducing vent support/ switching to spontaneous mode.
'Normal' EDi peak 5-20μV.

Question or issue

HIGH OR INCREASED EDI SIGNAL

Potential cause	Guidance to consider
• Ventilator under-assist?	Increase oxygen and/or ventilation support
• Anxiety / discomfort?	Optimise comfort, vent synchrony, pain relief, sedation
• PEEP set too low?	Optimise PEEP
• Airway obstruction, e.g. secretion?	Check vent flow curves, suction/ check circuit/ filters
• Abnormal/pathologic breathing drive, worsened disease condition/ low pH +/- high $PaCO_2$?	Consider mandatory ventilation

EXAMPLE

CAUSE: Ventilator under-assist
ACTIONS: Increased Ventilation Support



In NAVA, NAVA level incrementally increased from 1.0 to 1.5

NAVA MODE CASE STUDY

Patient with severe bullous emphysema and viral community-acquired pneumonia. Could not be ventilated with conventional pressure support. Uncomplicated transition to NAVA.
NAVA level incrementally increased from 1.0 to 1.5 providing more ventilation support.

Reasonably common. Patients in ICU often have increased respiratory drive and require more ventilation support.
EDi peak for most patients: 5-20μV.

But, remember: In patients with COPD, other chronic pulmonary diseases or with acute lung injury, EDi peak may be higher than 20 μV. Continue to optimise ventilator setting based on usual physiological parameters as any other mode.

Question or issue

HIGH OR INCREASED EDI SIGNAL

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EXAMPLE

CAUSE: Anxiety/ discomfort
ACTIONS: Family Reassurance

BEFORE



Without Family

AFTER



With Family Reassurance

NAVA MONITORING CASE STUDY

Monitoring neural drive in patient with significant agitation on waking/delirium. Very high Edipeak (eg 34 uV). Good neural drive despite Propofol and Dexmedetomidine infusions on significant amounts. Neural drive and pressure support seem well syncronised. Edipeak rapidly fell (within one breath) when partner reassured her (to <20uV).

Reasonably common. EDi is a useful tool to support wider picture of patient comfort.

Question or issue

VOLUME DELIVERY RESTRICTED/ PRESSURE LIMITED ALARMS

Potential cause	Guidance to consider
The upper pressure limit alarm may be set too low. As with all modes, the maximal pressure will be limited to 10% below the set limit alarm.	...Review alarm settings, upper pressure limit alarm may be set too low.

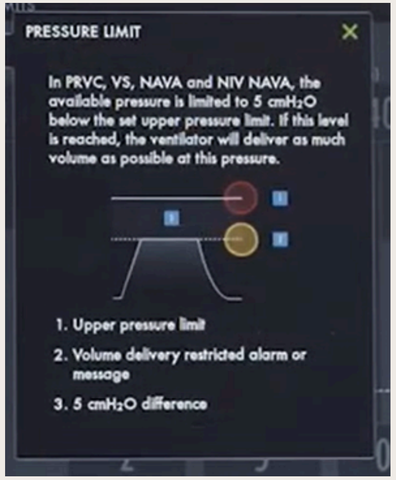
EXAMPLE

CAUSE: When put into NAVA Mode 'Volume Delivery Restricted' began to alarm as set too low.
ACTIONS: If appropriate, increase Ppeak alarm (as it is also a limiter) to allow breath in NAVA Mode.

Alarm Limits View



Press i for more information



Obvious when ventilator is alarming, look at trends window for history



Less common, read the alarm and look back at trends

Question or issue

DISORDERED SPIKEY EDI CURVE

Potential cause	Guidance to consider
• NAVA catheter out of position?	Optimise position
• Flow trigger setting too sensitive?	Consider pressure trigger
• Electrical interference?	Optimise position/ EDi trigger, consider catheter replacement

EXAMPLE

CAUSE: NAVA Catheter out of position
ACTIONS: Remeasured NEX & optimised in EDi Positioning Window.

BEFORE



DURING



AFTER



NAVA MODE CASE STUDY

Patient with cardiac failure and muscle weakness, had low neural drive when Edi catheter placed. The low neural drive signal gave an unreliable location. Occasional ECG strikes could be seen indicating catheter not actually in far enough. Advanced 5 cm from 65cm to 70cm and neural drive became immediately clear. The patient was then placed in NAVA without difficulty-the initial NAVA level was set against the existing pressure-support breath. This highlighted the importance of considering neural catheter position if drive appears flat. It also highlighted that if the neural drive signal is flat, occasional pink strikes on ECG positioning tool, may be unreliable, perhaps originating from background.

Reasonably common particularly when initially inserted, it's easy to incorrectly measure NEX. Recommend checking NEX measurement with a colleague.

Question or issue

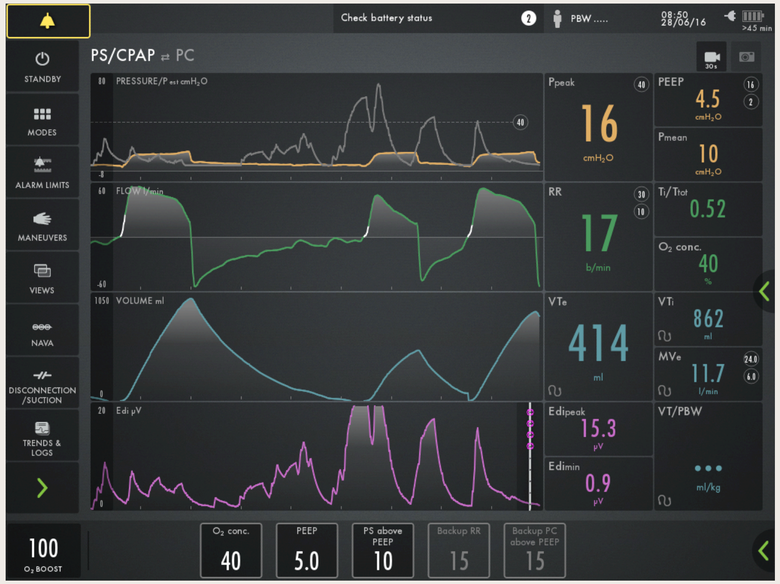
DISORDERED SPIKEY EDI CURVE

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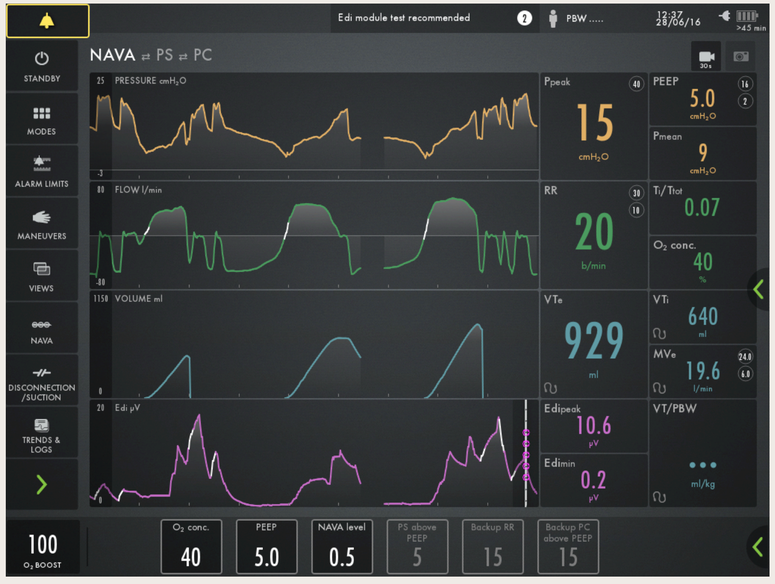
EXAMPLE

CAUSE: Electrical interference

ACTIONS: Change EDi cable/ reperform module check/ change module slot on vent, ECG leads change/ reposition, remove unneeded electrical equipment, increase EDi trigger, give time, catheter change.







NAVA MONITORING CASE STUDY

NAVA Catheter inserted, can see ECG spikes on EDi waveform.

Less common but is probably the most complex issue to troubleshoot. NAVA Mode may not be appropriate for the patient.
Give some time and reassess EDi waveform later.

Question or issue

DISORDERED SPIKEY EDI CURVE

Potential cause	Guidance to consider
• NAVA catheter out of position?	Optimise position
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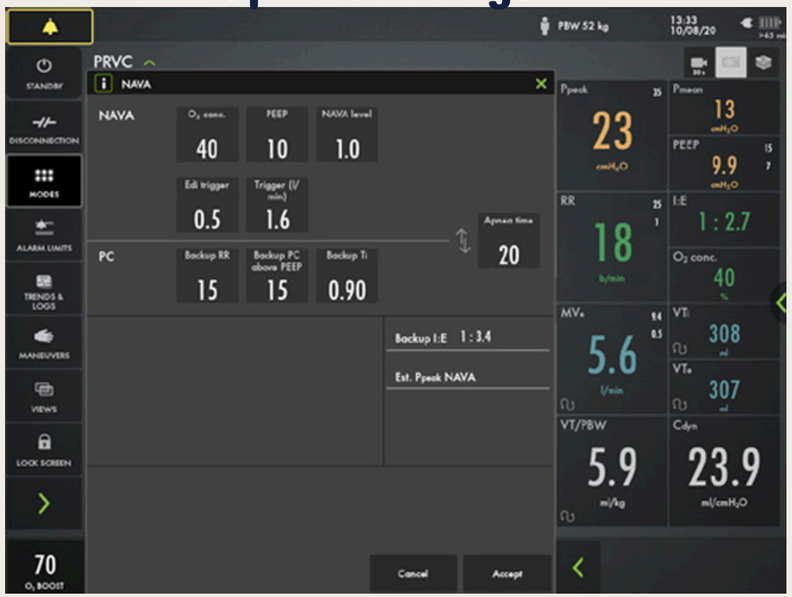
EXAMPLE

CAUSE: Flow trigger setting too sensitive
ACTIONS: Consider pressure trigger

Example A



Open Settings



Changing flow/ pressure trigger



NAVA MODE CASE STUDY

NAVA Catheter inserted, can see triggered breaths on EDi waveform and flow waveform.
Some flow or pressure triggered breaths are normal as patients may be using accessory muscles - as is the scenario with this example. Trigger is detected by ventilator and first come first serve, but will always stay proportional to EDi waveform if present.
If most breaths are flow or pressure triggered, change trigger settings.
Read the text on the Servo-u by the scaling: Less patient effort and more patient effort.

Less common, easily visible and simple to troubleshoot.

Question or issue

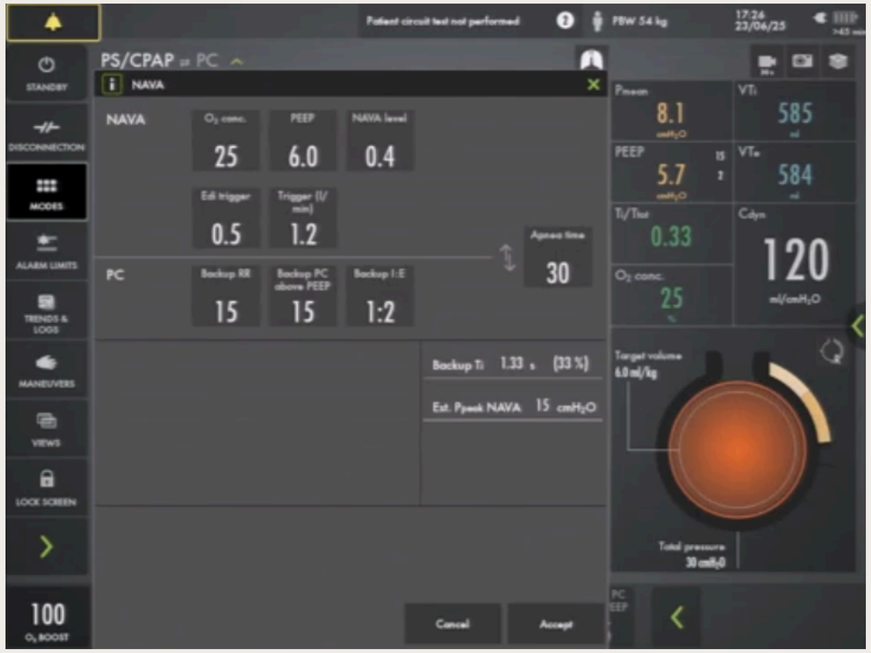
WHY IS THE VENTILATOR SWITCHING TO BACKUP PRESSURE CONTROL VENTILATION?

CAUSE: Patient apnoea / NAVA Catheter disconnection/ ECG or other electrical interference with the EDi signal/ major discrepancy between flow/ pressure EDi signal.
ACTIONS: Read the alarm displayed or look back at alarms on trends to troubleshoot.

Alarms associated with NAVA

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.
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	Error in the Edi catheter.	Replace Edi catheter.
Volume delivery is restricted	The pressure is limited to 5 cmH_2O below the set upper pressure limit, which restricts the volume delivery.	The pressure is limited to 5 cmH_2O below the set upper pressure limit, which restricts the volume delivery. 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.

Enter NAVA and back-up PC settings



Less common, obvious though when it happens. Look back at trends to troubleshoot cause.

FURTHER READING

FURTHER READING

Systematic reviews (clinical outcomes)

Kampolis CF, Mermiri M, Mavrovounis G, Koutsoukou A, Loukeri AA, Pantazopoulosl.
Comparison of advanced closed-loop ventilation modes with pressure support ventilation for weaning from mechanical ventilation in adults: A systematic review and meta-analysis.
J Crit Care 2022;68:1-9. https://doi.org/10.1016/j.jcrc.2021.11.010

Yuan X, Lu X, Chao Y, Beck J, SinderbyC, XieJ, et al.
Neurally adjusted ventilatory assist as a weaning mode for adults with invasive mechanical ventilation: a systematic review and meta-analysis.
Crit Care 2021;25(1):222. 10.1186/s13054-021-03644-z

King's College Hospital Feasibility Studies

Hadfield D, Rose L, Reid F, Cornelius V, Hart N, Finney C, et al.
Factors affecting the use of neurally adjusted ventilatory assist in the adult critical care unit: a clinician survey.
BMJ Open Respiratory Research 2020;7(1):e000783. 10.1136/bmjresp-2020-000783

Hadfield DJ, Rose L, Reid F, Cornelius V, Hart N, Finney C, et al.
Neurally adjusted ventilatory assist versus pressure support ventilation: a randomized controlled feasibility trial performed in patients at risk of prolonged mechanical ventilation.
Crit Care 2020;24(1):220. 10.1186/s13054-020-02923-5

Systematic Review (Ventilator Synchrony)

Pettenuzzo T, Aoyama H, Englesakis M, Tomlinson G, Fan E.
Effect of Neurally Adjusted Ventilatory Assist on Patient-Ventilator Interaction in Mechanically Ventilated Adults: A Systematic Review and Meta-Analysis.
Crit Care Med 2019;47(7):e602-e9. 10.1097/CCM.0000000000003719

General reviews

Bosma, K. J. (2025).
Proportional modes to hasten weaning.
Current Opinion in Critical Care 31(1): 57-69.

Jonkman AH, Rauseo M, Carteaux G, Telias I, Sklar MC, Heunks L, et al.
Proportional modes of ventilation: technology to assist physiology.
Intensive Care Med 2020;46(12):2301-13. 10.1007/s00134-020-06206-z

Umbrello M, Antonucci E, Muttini S.
Neurally Adjusted Ventilatory Assist in Acute Respiratory Failure-A Narrative Review. J Clin Med 2022;11(7). 10.3390/jcm11071863

Automated Weaning Technologies

FURTHER SUPPORT

WWW.UKNAVA.COM

Website providing support and examples of patients that have received NAVA technology.

UK NAVA

MDT e-learning QR code

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