

**Neurally Adjusted Ventilatory Assist as an alternative to Pressure
Support Ventilation – A multicentre randomized trial**

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Online supplement

Table E1. Main differences between Pressure Support Ventilation (PSV) and Neurally Adjusted Ventilatory Assist (NAVA)

	PSV	NAVA
Ventilator triggering		
<i>Principle</i>	The ventilator is triggered when flow or pressure at airway opening exceed a preset value.	The ventilator is triggered when the EAdi signal exceeds a preset value in μV .
<i>Setting</i>	Preset value is set in $\text{l}\cdot\text{s}^{-1}$ or cmH_2O .	Preset value is set in μV .
Airway pressurization - Level of assistance -		
<i>Principle</i>	Airways are pressurized at the preset “pressure support level”.	Airways are pressurized in proportion of the EAdi signal.
<i>Setting</i>	Pressure support level, expressed in cmH_2O .	NAVA level : factor by which the EAdi signal is multiplied to adjust the amount of assist delivered to the patient.
<i>Relationship between the level of assistance and the intensity the patient inspiratory effort.</i>	The level of assistance is constant, irrespective of the intensity of the patient inspiratory effort.	The level of assistance is proportional to the EAdi, a surrogate of the intensity of the patient ventilatory drive.
Ventilator cycling-off		
<i>Principle</i>	Airway insufflation by the ventilator ends when the inspiratory flow falls below a set proportion of the maximal inspiratory flow.	Airway insufflation by the ventilator ends when the EAdi falls below 70% of its peak value.
<i>Setting</i>	Cycling-off can be adjusted. In most ventilators, cycling-off value is set between 25% and 30% by default.	Fixed (70% of EAdi peak value) cannot be adjusted

EAdi, electrical activity of the diaphragm.

Table E2. Definition of the five main asynchronies and the asynchrony index

Asynchronies	Definitions
Ineffective effort (n.min⁻¹)	Presence of a characteristic EAdi activity not followed by a ventilator-delivered pressurization
Late cycling (n.min⁻¹)	Duration of pressurization at least twice as long as the patient's neural inspiratory time
Double triggering Type (n.min⁻¹)	Two respiratory cycles due to a biphasic EAdi signal
Premature cycling (n.min⁻¹)	Duration of pressurization at least twice shorter than the patient's neural inspiratory time
Auto-triggering (n.min⁻¹)	A cycle delivered by the ventilator in the absence of EAdi signal
Asynchrony index (%)	$\frac{[(\text{auto-triggering} + \text{ineffective efforts} + \text{late cycling} + \text{premature cycling} + \text{double triggering}) / (\text{ineffective effort} + \text{breath rate})] \times 100}{}$

EAdi, electrical activity of the diaphragm.

The number of each type of asynchrony was reported as the total number of each event per minute (n.min⁻¹).

Table E3. Volume of patients per year and enrolment rate per centre

	Volume of patients admitted per year, n	Enrollment rate per year, %
Centre 1	569	6.7
Centre 2	568	1.1
Centre 3	406	2.7
Centre 4	646	0.8
Centre 5	732	1.6
Centre 6	516	0.8
Centre 7	744	0.3
Centre 8	462	3.0
Centre 9	698	1.3
Centre 10	889	2.8
Centre 11	666	0.3

Table E4. Causes of respiratory failure

	PSV (n = 66)	NAVA (n = 62)
<i>De novo. n (%)</i>	38 (58)	34 (55)
Pneumonia. n (%)	23	21
Aspiration. n (%)	7	4
Extra pulmonary sepsis. n (%)	3	3
Other. n (%)	5	6
<i>Postoperative. n (%)</i>	13 (20)	13 (21)
Pneumonia	3	3
Extrapulmonary sepsis	2	3
ARDS following cardiothoracic surgery	4	4
Hemorrhagic shock. trauma	2	2
Other	2	1
<i>Acute-on-chronic. n (%)</i>	12 (18)	12 (19)
<i>Acute cardiogenic pulmonary oedema. n (%)</i>	3 (5)	3 (5)

Table E5. Main reasons for switch to controlled mechanical ventilation

	PSV (n = 60)	NAVA (n = 58)	P
Respiratory distress. hypoxaemia or hypercapnic acidosis despite optimization of ventilator settings. n (%)	8 (13)	5 (9)	0.414
Severe hypotension. shock or arrhythmias. n (%)	1 (2)	2 (3)	0.378
Increased need for sedation for agitation or patient-ventilator asynchrony. n (%)	1 (2)	2 (3)	0.378
Investigation requiring an increase of sedation for (gastrointestinal endoscopy. transoesophageal echocardiography. surgery). n (%)	10 (17)	9 (16)	0.865
Other. n (%)	2 (3)	1 (2)	0.579

Table E6. Comparison of patients' characteristics and baseline variables between failure and success patients

	Failure of partial ventilatory mode n=39	Success of partial ventilatory mode n=79	p
Age. years	61 (58-71)	72 (58-78)	0.172
Sex. male. n (%)	30 (38)	48 (62)	0.081
SAPS 2	44 (34-63)	43 (34-58)	0.610
Blood gases			
PaO ₂ /FiO ₂ . mmHg	233 (187-280)	226 (190-280)	0.811
PaCO ₂ . mmHg	40 (34-45)	39 (34-48)	0.806
Dyspnoea-VAS. from 0 to 10	1 (0-3)	1 (0-3)	0.945
Duration of mechanical ventilation prior to inclusion. days	4 (3-8)	5 (3-9)	0.401
Cause of acute respiratory failure			0.420
Acute-on-chronic n (%)	8 (53)	7 (47)	
Acute cardiogenic pulmonary edema. n (%)	1 (20)	4 (800)	
De novo. n (%)	22 (33)	44 (67)	
Postoperative. n (%)	7 (27)	19 (73)	
Study group. NAVA. n (%)	19 (49)	39 (49)	0.663

SAPS, simplified acute physiology; NAVA, neurally adjusted ventilatory assist.

Continuous data are reported as median (interquartile range [IQR]) and categorical data are reported as number of events (percentages).

Table E7. Time spent in each mechanical ventilation mode during the first 48 hours following inclusion

	PSV (n = 66)	NAVA (n = 62)	P
Pressure support ventilation (PSV). <i>h</i>	47.1 (39.8-48.0)	2.5 (0.8-12.3)	<0.0001
PSV-Pressure control^a. <i>h</i>	1.5 (0.5-2.4)	0 (0-0)	ND
Neurally adjust ventilator assist (NAVA) . <i>h</i>	NA	44.1 (33.0-47.8)	NA
NAVA-PSV^b. <i>h</i>	NA	0.7 (0.3-2.2)	NA
NAVA-Pressure control^c. <i>h</i>	NA	0.85 (0.4-1.2)	NA
Assist-control ventilation. <i>h</i>	3.0 (1.0-10.5)	2.1 (0.6-25.5)	0.812
Pressure-regulated volume control. <i>h</i>	4.5 (1.8-8.5)	1.3 (0.8-7.3)	0.330
Pressure control ventilation. <i>h</i>	1.2 (0.6-1.8)	0 (0-0)	ND

(a) PSV-Pressure control. pressure control ventilation as back-up mode of PSV.

(b) NAVA-PSV. PSV as a primary back-up mode in NAVA.

(c) NAVA-Pressure control. pressure control ventilation as secondary back-up mode in NAVA.

Table E7. Respiratory variables at three time points during the first 5 days of treatment

	24 hours			48 hours			Day-5		
	PSV (n = 66)	NAVA (n = 60)	P	PSV (n = 66)	NAVA (n = 58)	P	PSV (n = 25)	NAVA (n = 22)	P
Dyspnoea, n (%)	19 (66)	9 (28)	0.03	13 (52)	14 (50)	0.54	6 (46)	3 (30)	0.67
ATICE score	16.5 (13-19)	16 (11-19)	0.66	16.5 (11-20)	18 (12-20)	0.68	17 (14-19)	16 (11-20)	0.66
PEEP level, cmH₂O	6 (5-8)	6 (5-8)	0.52	6 (5-8)	6 (5-8)	0.97	6 (5-8)	6 (5-8)	0.67
PSV level, cmH₂O	12 (10-14)	NA	NA	12 (10-12)	NA	NA	10 (8-12)	NA	NA
NAVA level, cmH₂O.μV⁻¹	NA	1.8 (1.0-2.5)	NA	NA	1.9 (1.0-2.8)	NA	NA	1.3 (1.0-3.0)	NA
Tidal volume, ml	461 (400-530)	455 (410-550)	0.69	456 (386-549)	444 (380-535)	0.65	467 (425-587)	439 (380-572)	0.33
Tidal volume, ml.kg⁻¹	7.2 (6.3-8.3)	7.2 (6.4-8.2)	0.92	7.2 (6.4-8.3)	7.15 (6.3-8.3)	0.53	7.1 (6.6-9.2)	6.8 (5.9-8.7)	0.34
Minute ventilation, l.min⁻¹	10.0 (8.9-12.4)	11.7 (10-13)	0.045	11.0 (9.4-13.4)	10.4 (8.5-12.4)	0.44	11.5 (9.95-13.0)	11.0 (8.7-14.0)	0.57
Respiratory rate^a, min⁻¹	23 (20-26)	26 (20-29)	0.09	24 (18-29)	24 (19-28)	0.95	25 (22-28)	25 (23-30)	0.53
PaO₂/FiO₂, mmHg	217 (166-293)	237 (179-305)	0.66	247 (189-320)	262 (198-305)	0.68	197 (170-277)	261 (186-.51)	0.11
pH	7.43 (7.39-7.47)	7.45 (7.40-7.47)	0.29	7.43 (7.39-7.46)	7.44 (7.39-7.47)	0.74	7.42 (7.40-7.43)	7.44 (7.37-7.46)	0.87
PaCO₂, mmHg	40 (36-46)	39 (33-48)	0.41	40 (34-46)	41 (34-51)	0.71	42 (37-49)	41 (39-48)	0.88

PSV, pressure support ventilation; NAVA, neurally adjust ventilator assist; ATICE, adaptation to intensive care environment (evaluates comfort, ranges from 0 to 20).

^aRespiratory rate was computed based on ventilator breaths.

Continuous data are reported as median (interquartile range [IQR]) and categorical data as number of event (percentages).