The most fragile of lives deserve advanced personalized ventilation

Servo-n – the versatile ventilator to help neonates breathe, sleep and grow

GETINGE

Every neonate is unique. Now you can personalize the treatment.

Help them breathe, sleep and grow

As a NICU professional, you deserve the optimal tools to help tiny neonates, breathe, sleep and grow. Creating a calm, caring environment and finding just the right level of respiratory support, without over- or under-assist, is a delicate balance.[1] That is why, for the past 30 years, Getinge has constantly refined and optimized its Servo ventilators to provide advance respiratory care for your most fragile patients.

Avoid patient-ventilator asynchrony

Packed with one-of-a-kind therapy modes, Getinge Servo-n® allows you to avoid patient-ventilator asynchrony by continually assessing the baby's own physiology[2,3,4] – every step of the way. As a result, you can personalize your respiratory treatment[5,6] for each and every baby, helping to protect their lungs, brain and other developing organs.[7,8,9]

A versatile neonatal solution

Whether it's invasive or non-invasive ventilation, HFOV or NAVA, Servo-n has all the ventilation modes you need to deliver high-end neonatal care, including a unique therapy (NAVA) for tailored respiratory treatments. In short, the kind of baby-friendly personalized ventilation your tiny patients deserve to get a a good start in life.

Servo-n the versatile ventilator to help neonates breathe, sleep and grow

One advanced ventilator. Many flexible treatment options.

How many neonatal ventilators do you have in your NICU right now? One for conventional ventilation? Another for HFOV? Yet another device for Nasal CPAP and High Flow therapy? While it's helpful to have options on hand, changing ventilators and patient circuits on tiny babies can jeopardize continuity of care. Servo-n solves this issue with an all-in-one solution for baby-friendly mechanical ventilation.

30 years of supporting demanding NICUs

Based on 30 years of close collaboration with neonatal professionals at hospitals all over the world, we've continued to refine and improve our neonatal ventilatory solution. Having now supplied close to 200,000 Servo ventilators, we also know that saving infants born as early as 22 weeks GA requires special modes of ventilatory support to mitigate risks and secure protective care.

Advanced baby-friendly respiratory support

An advanced solution for neonates, the Servo-n comes with unique ventilatory modes, monitoring and diagnostic capabilities to improve comfort and lower the work of breathing.[10-12] This may reduce the number of babies that need intubation,[13,14] decrease the amount of sedation and pain medication,[11,15-17] provide lower pressures and enhance oxygenation.[3,12,15,17,18] These benefits may all contribute to allowing babies to rest more, so their energy can be spent on growing and maturing, rather than just trying to breathe.

Personalized lung and brain protection – every step of the way

Assess

Diaphragm monitoring (Edi) aids you, in determining and providing the appropriate support the babies want and need,[2] while managing sedation[11,15-17] and monitoring apnea of prematurity.[4,19,20]

Prevent

If Nasal CPAP is not enough to support babies on non-invasive ventilation, NIV NAVA® offers a viable alternative. Studies show that it may increase the chance of NIV success[21] and reduce the need for intubation[8,9] and sedation.

Protect

With NAVA, you have the opportunity to personalize the ventilatory support and protect the neonates lungs. And if the babies need controlled ventilation, PRVC is there for you.[22]

Rescue

Built-in HFOV allows you to quickly start the therapy without losing mean airway pressure or having to switch ventilators.

Wean

There are several modes to help you wean with Servo-n. Most interesting is NAVA, which will essentially allow the patients to wean themselves.[21,23]

Design so intuitive you won’t even think about it

Neonatal ventilation can be complex. The Servo-n is designed to simplify this. In every design detail – from the touchscreen, with its clear, intuitive graphic user interface, to the hot swappable batteries and ergonomic engineering – it helps to streamline your workflow. This way, you spend less time operating the ventilator and more time caring for your baby.

Neonatal staff often praise our light, compact design with the baby-friendly ladybug. Yes, it supports a calm NICU environment. But make no mistake: Servo-n has all the advanced design features you would expect of a modern neonatal ventilator. An intuitive touchscreen makes it very simple to learn and easy to use. Help menus, recommendations and prompts ensure that your staff can adapt to the needs of each baby and follow guidelines. The interface also simplifies knowledge sharing, making it easy to retrieve screenshots and recordings or connect to a larger screen.

360° rotatable screen

The screen can be rotated 360°, depending on your clinical requirements. You can also mount it to a pendant or shelf. Then just choose your viewing preference – from Basic, Advanced and Loops to Servo Compass®, Distance and Family View. Alarm management helps you manage and avoid undesired alarms.

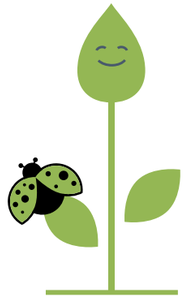
Highly rated by experts

Neonatal and ICU professionals gave the interface a 6.8 out of 7 (98%) usability rating.[24] It also comes with six battery slots, two as standard, providing 60 minutes of charge, with up to 180 minutes using six – making it highly suitable for intra-hospital transport.

98%
usability rating by ICU professionals[23]

See and deliver what your baby needs – at every step

The more you know, the better they do. But assessing the optimal level of support for a neonate can be challenging. Although there are many types of respiratory monitoring, Servo-n is the only ventilator that lets you measure the electrical activity of the diaphragm (Edi) and display it on-screen. This vital sign of ventilation can help you select the level of support required – during any mode of ventilation.[4,25-27]



Optimal support at any time

Edi helps you detect and monitor work of breathing and the presence or absence of breathing.[4,14,19] This may help you identify what type of support is best for your patients without delay.[27] It can help you prevent intubation but also determine when it is necessary.[8,9] Once you decide on the most appropriate support, you can utilize Edi to optimize it.

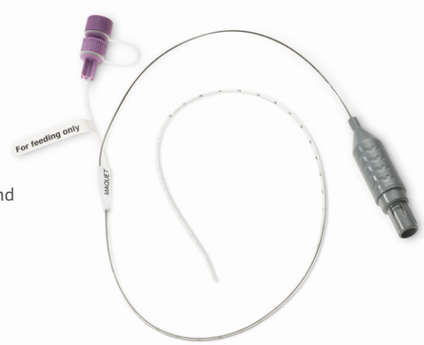
Avoid asynchrony and disruptions

By comparing Edi with the pressure curve, you can identify patient-ventilator asynchrony, such as wasted efforts and delayed triggering.[5,6] In addition, the Edi minimum can indicate if the diaphragm relaxes between breaths and helps to prevent derecruitment of alveoli during expiration.[28] Monitoring the diaphragm can also help you tailor caffeine treatment,[29] sedation,[30] kangaroo care[31] and ideal resting positions.[32] It may even be valuable in discovering disruptions in the respiratory drive and to help determine extubation readiness.[33]

Assess growth and maturity

Edi allows you to trend and monitor the respiratory pattern and apnea. This will help you determine maturity and identify severe apnea that could otherwise lead to bradycardia or desaturation.[34]

The Edi signal is displayed in the lower part of the screen.



The neonatal Edi catheter has tiny electrodes that pick up signals originating in the brain's respiratory center and transmitted via the phrenic nerve to the diaphragm.

Prevent intubation with our unique non-invasive therapies

You want to avoid intubation of the baby. But how do you personalize non-invasive ventilation based on the baby's current condition? With Servo-n, you get a full suite of safe and gentle non-invasive ventilation modes, from Nasal CPAP to our unique NIV NAVA, to conventional NIV modes – all of which can be used without switching ventilators.

Starting with Nasal CPAP

Every clinician's goal is to deliver Nasal CPAP as early as possible when needed. In the delivery room, its use can decrease the number of babies that need intubation and the number of overall ventilator days.[35,36] The CPAP on Servo-n provides a constant distending pressure with varying flow to support spontaneous breathing, which may decrease the work of breathing.[37]

Moving to NIV NAVA

For some neonates (about 45%), Nasal CPAP is not enough.[38] This is when NIV NAVA can help. It uses the neonate's own diaphragm activity to drive the ventilation. This mode is leakage independent and increases patient-ventilator synchrony[10, 21, 26, 39] which may result in less sedation.[40] Airway pressures and blood gases normalize with lower work of breathing, indicating higher chances of Nasal NIV success and less time on ventilatory support.[21, 39, 41,42]

Clinical experience of Turku University Hospital

Fewer intubations with Nasal CPAP and NIV NAVA, among other ventilation modes, have proven useful for Professor Liisa Lehtonen, MD, Head of the Division of Neonatology at Turku University Hospital in Turku, Finland. She and her team have been conducting research into ways to optimize the long-term outcomes of preterm infants.

"We now see improved sleep and average weight gain, decreased exposure to painful procedures and pain medication, decreased risk of hyperventilation, fewer infections and less inflammation." [43, 44]

Professor Liisa Lehtonen, MD
Turku University Hospital, Turku, Finland

Personalize your lung and brain protection – with every tiny breath

The sooner your babies can be stabilized, the faster they can be weaned and recover. Your ability to achieve this will depend as much on your expertise as a NICU professional as on having access to advanced tools. Servo-n, with NAVA, PRVC, Automode, High Flow therapy and more, allows you to personalize the treatment for better outcomes.

Neurally Adjusted Ventilatory Assist (NAVA)

NAVA is superior in supporting spontaneous breathing in neonates, targeting poor compliance and poor blood gases, without a higher pressure setting that is often seen in other modes. When babies are on this mode, they tend to choose lower pressure and tidal volumes with improved compliance and synchrony, improving their blood gases and oxygenation.[5,6] NAVA allows the neonates to regulate their own ventilation, limiting the risk of over- or under-assist. NAVA also lowers the work of breathing, increases comfort which may reduce the need for sedation. This may allow for more sleep and greater energy for growth and maturation.

Pressure Regulated Volume Control (PRVC)

PRVC is a volume-targeted mode that automatically adapts the inspiratory pressure to account for changes in lung mechanics. Separated regulation of controlled and assisted breaths reduces tidal volume swings and ensures low driving pressure, even when the patient starts to trigger the ventilator.

Automode

Automode supports smooth and safe patient transitions between controlled and supported ventilation. It seamlessly shifts between triggered and controlled breaths during irregular breathing – all without alarms and with an adjustable apnea time.

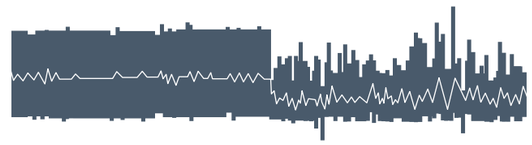
Protecting the brain

- Reduced risk of hyper- or hypo-ventilation since neonates self-regulate their blood gases[12,28,45,46]
- The potential for improved duration and quality of natural sleep, thanks to improved ventilator-patient synchrony, comfort and breathing variability[3,4,10-12]
- Less exposure to analgesics and sedatives minimizing the potential neurologic damage from these medications[2,11,15-17]
- Indications for decreased length of stay in the ICU[14,15,42]

26 weeks GA | 38 week GA

Lowering pressure

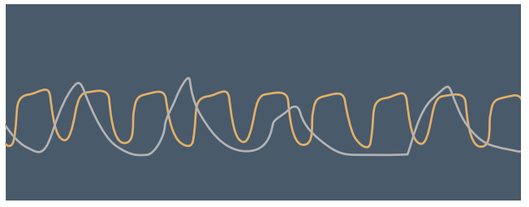
The trend shown illustrates a neonate that was switched from SIMV to NAVA, resulting in an immediate drop in pressure. The baby is actively using his diaphragm, which lowers the pressure and allows him to recruit his own lungs with sighs.



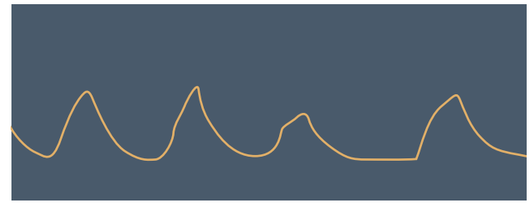
Switch from SIMV to NAVA (pressure curve trend)

Improving comfort

Compare pressure control with NAVA below. NAVA's support is so sensitive the baby can breathe as she wants and needs with proportional assist. This improves synchrony and comfort and may allow the baby to spend energy on growing rather than fighting the ventilator.



SIMV, pressure curve (yellow) with Edi overlay (white)



Pressure curve in NAVA

Built-in high-frequency oscillatory ventilation with a difference

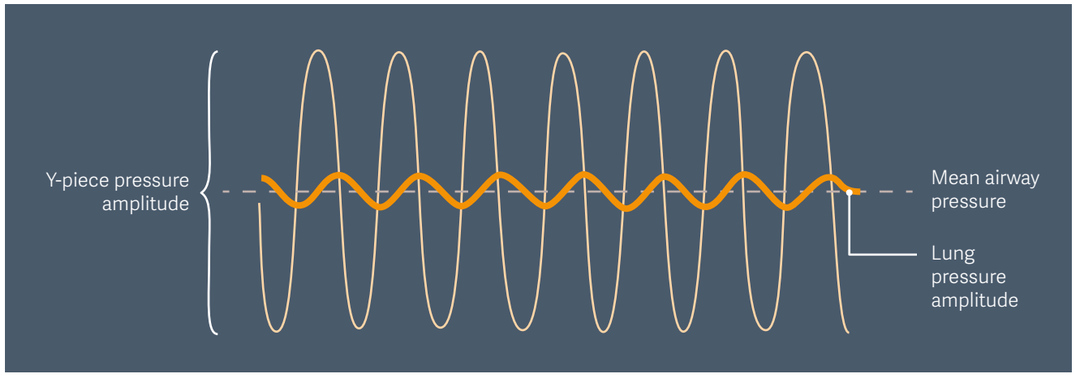
If your preterm infant is not responding to conventional mechanical ventilation or is in an acute, critical or poor state of health, it's good to know you've got a built-in HFOV mode on your Servo-n. This can be potentially life-saving in situations where seconds count, since you don't need to hook up a separate bulky HFOV unit.

High Frequency Oscillatory Ventilation (HFOV)

When conventional mechanical ventilation is not enough, HFOV can improve ventilation and oxygenation with minimal barotrauma.[47] HFOV delivers a small, yet precise, tidal volume at high frequency. It can give your patients a quick CO_2 washout and provide ventilation for pre- and full-term babies with just a switch from a conventional mode, reducing the stress on you and your patients. It can also be delivered with a volume target option, which helps reduce high frequency tidal volume fluctuation and lowers the incidence of out-of-target PCO_2.[47]

Unique inertia-based HFOV concept

The Servo-n HFOV concept is different. Instead of just pushing in gas, it relies on the inertia of air in the patient circuit when the pressure at airway opening is modified rapidly, combined with very rapidly responding inspiratory valves and high-flow capability. A transducer rate of around 2,000 times per second is achieved using special microprocessor-controlled valves. The unique design with rapidly responding and synchronized inspiratory and expiratory valves results in active expiration and may facilitate low work of breathing.[48]



The unique inertia-based HFOV concept on Servo-n relies on rapidly moving valves that push in gas during inspiration and then pull it out during expiration, helping to reduce work of breathing and encourage spontaneous breathing.

Personalized weaning on the path to better outcomes

Your ultimate goal is to encourage spontaneous breathing and gently ease the baby off ventilation entirely. Since each baby will be different, Servo-n helps you personalize this process to meet their individual weaning requirements, from invasive to non-invasive ventilation (NIV PC, Nasal CPAP and High Flow therapy) and beyond – on the same ventilator.

Assessing the readiness of weaning with Edi

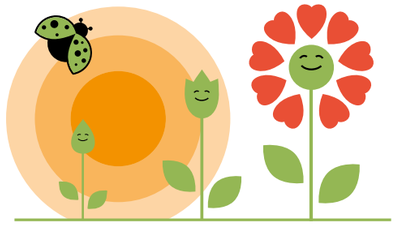
The Edi signal can be an invaluable tool for you to assess and help predict the likelihood of successful weaning. It is possible to follow the patient's progress and assess when assist is no longer necessary.[25,27,33] When on CPAP and High Flow therapy or after all support has been removed, the patient's respiratory recovery can still be evaluated with the Edi signal.

Weaning from the start of ventilation

Servo-n supports weaning from every step of ventilatory treatment. PRVC automatically adjusts the peak pressure, achieving the set tidal volume based on compliance.

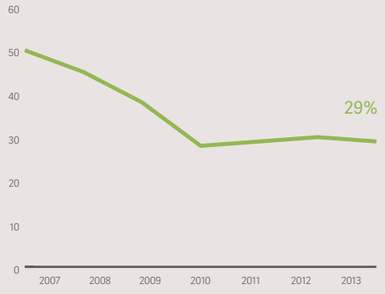
Applying NAVA in weaning

Spontaneous breathing with NAVA and NIV NAVA allows the diaphragm to work unhindered at the appropriate level. As the respiratory muscle improves and the disease subsides, the patients will essentially wean themselves. This can be observed by the decrease in amplitude of the Edi signal and a maintained tidal volume. You can further reduce the risk of re-intubation thanks to the leakage independence of NIV NAVA. This mode also allows for many types of interfaces that can be applied more comfortably.

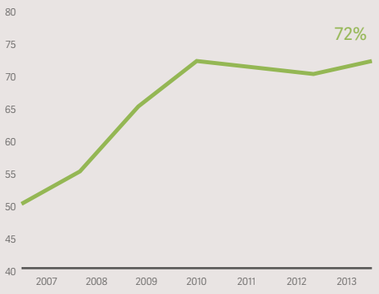


The Toledo Hospital journey towards better outcomes

Reduced death and morbidity in neonates by 40%

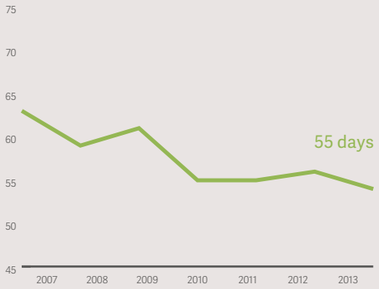


Survival without morbidity increased by 40%

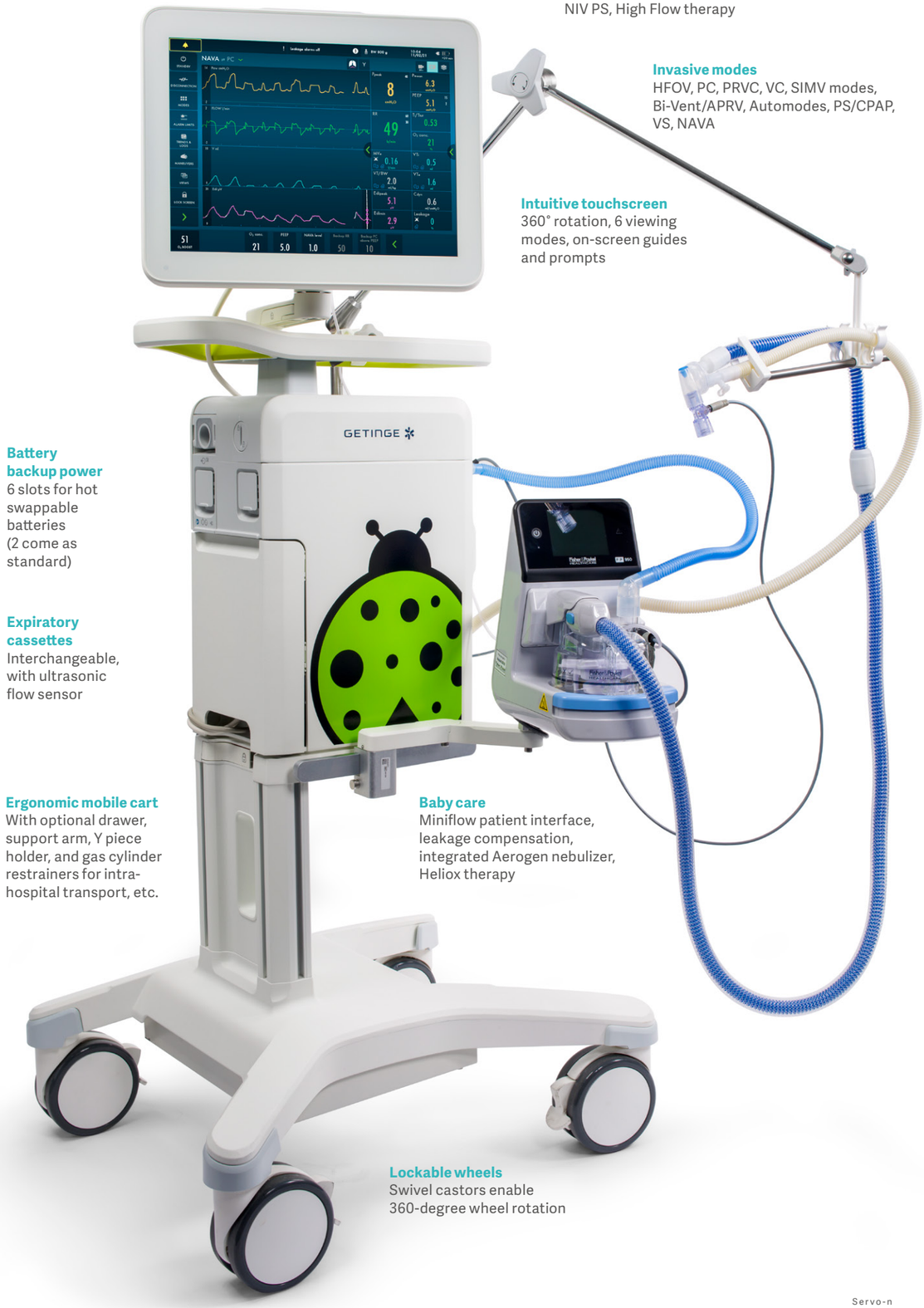


Decrease chronic lung disease by 70%

Reduction in median length of stay by 9 days



Dr. Howard Stein, MD, FAAP, at the Toledo University Hospital in Toledo, Ohio, USA, says there are a number of alterations to thank for his patients' improvements – PICC line reduction and non-invasive ventilation strategies, such as CPAP and NIV NAVA, to name a few. The neonates included in the data are below 1500 grams with no cardiac surgery and no ECMO.[46,49]



Maximize uptime and boost your efficiency to lower cost of ownership

The Servo-n is safe, easy to use and cost-efficient to maintain. From flexible service agreements and baby-friendly consumables to interchangeable plug-in modules and HL7 connectivity, you get a complete, cost-efficient solution for pediatric and neonatal patients. All designed to protect your investment.

Wide range of accessories and consumables

You can choose from a wide range of lightweight and comfortable NICU-designed consumables that are all tested and approved for use on Servo-n. This includes everything from active and passive humidifiers and filter options to special catheters, nebulizers, interfaces, face masks and tubing. If your hospital has other Servo ventilators, you'll be glad to know that Servo-n shares many of the same components and inter-changeable patient cassettes. This helps to improve efficiencies and drive down maintenance costs.

Effective, integrated nebulizer

In particular, our range of Aerogen® nebulizers offers intermittent or continuous use without affecting breathing. Easy and effective, they can be refilled during operation with a broad range of pharmaceuticals and controlled and monitored directly from your screen. Studies show that radioaerosol deposition into the lungs is significantly higher with Aerogen®, a vibrating mesh design, versus traditional jet nebulization.[50]

Preventive service agreements

With over 240 service centers world-wide, we keep in close touch with our NICU customers, supporting you with service agreements to maximize the long-term value or your investments. Our Getinge Care package offers four different levels of support, ensuring that your Servo-n is always delivering peak performance. Just ask us for details.

Less maintenance and more uptime

Finally, our Servo-n has few parts to clean and is built for simplified maintenance based on top-quality components. Should you require support, our skilled service technicians and sales staff, many of whom have worked in clinical neonatal care, are always on hand to support you, making sure you get original parts and the right warrantees.

References

1. Vignaux L, Grazioli S, Piquilloud L, Bochaton N, Karam O, Jaecklin T, Levy-jamet Y, Tourneux P, Jolliet P. Rimensberger P. Optimizing patient ventilator synchrony during invasive ventilator assist in children and infants remains a difficult task. Ped Crit Care Med. 2013;14(7), 316-325.
2. Beck J, Reilly M, Grasselli G, et al. Patient-ventilator interaction during neurally adjusted ventilatory assist in low birth weight infants. Pediatr Res 2009;65(6):663–8.
3. Longhini F, Ferrero F, De Luca D, et al. Neurally adjusted ventilatory assist in preterm neonates with acute respiratory failure. Neonatol. 2015;107(1):60-7
4. Mally PV, Beck J, Sinderby C, et al. Neural breathing pattern and patient-ventilator interaction during neurally adjusted ventilatory assist and conventional ventilation in newborns. Pediatr Crit Care Med 2018;19(1):48–55.
5. Beck J, Emeriaud G, Liu Y, Sinderby C. Neurally-adjusted ventilatory assist (NAVA) in children: a systematic review. Minerva Anestesiol 2016;82(8):874-83.
6. Beck J, Sinderby C. Neurally adjusted ventilatory assist in newborns. Clin Perinatol 2021, Dec;48(4):783-811.
7. Tabacaru CR, Moores Jr RR, Khoury J, Rozycki HJ. NAVA-synchronized compared to nonsynchronized noninvasive ventilation for apnea, bradycardia, and desaturation events in VLBW infants. Pediatr Pulmonol. 2019 Nov;54(11):1742-6
8. Hovespyan K, Firestone KS, Moore J, Stein H. Effects of NAVA Compared to SIMV Ventilation on Cardiac Function in Preterm Neonates. Resp Care 2020;65(10):3451491.
9. Surkov D M. Neurally Adjusted Ventilatory Assist Mode of Mechanical Ventilation in Neonates with Hypoxic-Ischemic Encephalopathy. Ukr J Cardiov Surg 2019;2(35):102-11.
10. Baudin F, Emeriaud G, Essouri S, Beck J, Javouhey E, Guerin C. Neurally adjusted ventilatory assist decreases work of breathing during non-invasive ventilation in infants with severe bronchiolitis. Crit Care 2019;23(1):120.
11. De la Oliva P, Schuffelmann C, Gomez-Zamora A, Vilar J, Kacmarek RM. Asynchrony, neural drive, ventilatory variability and COMFORT: NAVA vs pressure support in pediatric patients. A randomized cross-over trial. Int Care Med. 2012;38:838-46.
12. Piastra M, De Luca D, Costa R, et al. Neurally adjusted ventilatory assist vs pressure support ventilation in infants recovering from severe acute respiratory distress syndrome: nested study. J Crit Care 2014;29(2):312:e1-5.
13. Firestone KS, Beck J, Stein H. Neurally Adjusted Ventilatory Assist for Noninvasive Support in Neonates. Clin Perinatol. 2016 Dec;43(4):707-24.
14. Chidini G, De Luca D, Calderini E, et al. Implementation of noninvasive neurally adjusted ventilatory assist in pediatric acute respiratory failure: a controlled before-after quality improvement study. J Anesth Analg & Crit Care 2021(Sep);1;1-9
15. Kallio M, Peltoniemi O, Anttila E, Pokka T, Kontiokari T. Neurally Adjusted Ventilatory Assist (NAVA) in Pediatric Intensive Care – A Randomized Controlled Trial. Pediatr Pulmonol. 2015 Jan; 50(1):55-62.
16. Lee J, Kim HS, Jung YH, et al. Neurally adjusted ventilatory assist for infants under prolonged ventilation. Pediatr Int 2017;59(5):540–4
17. Baez Hernandez N, Milad A, Li Y, et al. Utilization of neurally adjusted ventilatory assist (NAVA) mode in infants and children undergoing congenital heart surgery: a retrospective review. Pediatr Cardiol 2019;40(3):563–9.
18. Gibu CK, Cheng PY, Ward RJ, et al. Feasibility and physiological effects of noninvasive neurally adjusted ventilatory assist in preterm infants. Pediatr Res 2017; 82(4):650–7.
19. Parikka V, Beck J, Zhai Q, Leppäsalo J, Lehtonen L, Soukka H. The effect of caffeine citrate on neural breathing pattern in preterm infants. Early Hum Dev. 2015 Oct;91(10):565-8.
20. Rahmani A, Ur Rehman N, Chedid F. Neurally adjusted ventilatory assist (NAVA) mode as an adjunct diagnostic tool in congenital central hypoventilation syndrome. J Coll Physicians Surg Pak 2013; Feb:23(2):154-156
21. Makker K, Cortez J, Jha K, et al. Comparison of extubation success using noninvasive positive pressure ventilation (NIPPV) versus noninvasive neurally adjusted ventilatory assist (NI-NAVA). J Perinatol 2020;40(8):1202–10.
22. Keszler, M. Volume-targeted ventilation: one size does not fit all. Evidence based recommendations for successful use. Arch Dis Child Fetal Neonatal Ed 2018:1–5
23. Lee BK, Shin SH, Jung YH, et al. Comparison of NIV-NAVA and NCPAP in facilitating extubation for very preterm infants. BMC Pediatr 2019 Aug 28;19(1):298
24. Morita et al. The usability of ventilators: a comparative evaluation of use safety and user experience Crit Care (2016) 20:263
25. Ducharme-Crevier L, Du Pont-Thibodeau G, Emeriaud G. Interest of Monitoring Diaphragmatic Electrical Activity in the Pediatric Intensive Care Unit. Crit Care Res Pract. 2013: 384210.
26. Stein H, Firestone K. Application of neurally adjusted ventilatory assist in neonates. Semin Fetal Neonatal Med. 2014 Feb;19(1):60-9.
27. Emeriaud G, Larouche A, Ducharme-Crevier L et al. Evolution of inspiratory diaphragm activity in children over the course of the PICU stay. Intensive Care Med. 2014 Nov;40(11):1718-26
28. Protain AP, Firestone KS, McNinch NL, Stein HM. Evaluating peak inspiratory pressures and tidal volume in premature neonates on NAVA ventilation. Eur J Pediatr. 2021 Jan;180(1):167-175
29. Parikka V, Beck J, Zhai Q, Leppäsalo J, Lehtonen L, Soukka H. The effect of caffeine citrate on neural breathing pattern in preterm infants. Early Hum Dev. 2015 Oct;91(10):565-8
30. Amigoni A, Rizzi G, Divisic A et al. Effects of propofol on diaphragmatic electrical activity in mechanically ventilated pediatric patients. Intensive Care Med. 2015 Oct;41(10):1860-1.
31. Lee, J, Parikka V, Lehtonen, L, Soukka H. Parent-infant skin-to-skin contact reduces the electrical activity of the diaphragm and stabilizes respiratory function in preterm infants. 2021 Pediatr Res June.
32. Baudin F, Emeriaud G, Essouri S et al. Physiological effect of prone position in children with severe bronchiolitis: a randomized cross-over study (BRONCHIO-DV). J Pediatr 2019;205:112-9.
33. Wolf G, Walsh B, Green M, Arnold J. Electrical activity of the diaphragm during extubation readiness testing in critically ill children. Pediatr Crit Care Med 2010;12:e220e4.
34. Poets CF, Roberts RS, Schmidt B, et al. Canadian Oxygen Trial Investigators. Association between Intermittent Hypoxemia or Bradycardia and Late Death or Disability in Extremely Preterm Infants. JAMA. 2015 Aug 11;314(6):595-603
35. Morley CJ, Davis PG, Doyle LW et al. COIN Trial Investigators. Nasal CPAP or intubation at birth for very preterm infants. N Engl J Med. 2008 Feb 14;358(7):700-8.
36. SUPPORT Study Group of the Eunice Kennedy Shriver NICHD Neonatal Research Network, Finer NN, et al. Early CPAP versus surfactant in extremely preterm infants. N Engl J Med. 2010 May 27;362(21):1970-9.
37. Courtney SE, Pyon KH, Saslow JG, et al. Lung recruitment and breathing pattern during variable versus continuous flow nasal continuous positive airway pressure in premature infants: an evaluation of three devices. Pediatrics. 2001 Feb;107(2):304-8.
38. Dargaville PA, Gerber A, Johansson S, et al. Incidence and Outcome of CPAP Failure in Preterm Infants. Pediatrics. 2016;138:e20153985-e20153985.
39. Houtekie L, Moerman D, Bourleau A, et al. Feasibility Study on Neurally Adjusted Ventilatory Assist in Noninvasive Ventilation After Cardiac Surgery in Infants. Respir Care. 2015 Jul;60(7):1007-14
40. Longhini F, Scarlino S, Gallina MR et al. Comparison of neurally-adjusted ventilator assist in infants before and after extubation. Minerva Pediatr 2018 Apr;70(2):133-40
41. Yagui ACZ, Goncalves PA, Murakami SH, et al. Is noninvasive neurally adjusted ventilatory assistance (NIV-NAVA) an alternative to NCPAP in preventing extubation failure in preterm infants? J Matern Fetal Neonatal Med 2019;1–151
42. Shetty S, Evans, K, Cornuaud P, et al. Neurally Adjusted Ventilatory Assist in very prematurely born infants with evolving/established bronchopulmonary dysplasia. AJP Rep 2021;11(4):e127-e131.
43. Lehtonen, L. (EPNV, 2014). NAVA experiences and research in preterm infants. Retrieved from http://www.criticalcarenews.com.
44. Lehtonen, L. (EPNV, 2014). Hospital in Finland experiences a weight gain of 35% with NAVA - neonatal NAVA and individualizing treatment at bedside. Retrieved from http://www.criticalcarenews.com
45. Cosi G, Monzani A , Genoni G et al. Neurally Adjusted Ventilatory Assist (NAVA): a prospective interventional study in neonates. Minerva Pediatr. 2019 Apr 05
46. Stein H, Howard D. Neurally Adjusted Ventilatory Assist (NAVA) in Neonates less than 1500 grams: a retrospective analysis. J Pediatr 2012;160:786e9.
47. Meyers, N, Rodrigues N, Ari A. High-frequency oscillatory ventilation: A narrative review. Can J Resp Ther 2019. 55:40-6
48. Bordessoule A, Piquilloud L, Lyazidi A, Moreira A, Rimensberger PC. Imposed Work of Breathing During High-Frequency Oscillatory Ventilation in Spontaneously Breathing Neonatal and Pediatric Models. Resp Care 2018 Sep, 63(9):1085-1093.
49. Stein H. (APA, 2014). Neonatal outcomes. Retrieved from www.criticalcarenews.com.
50. Galindo-Filho, V.C. et al. Radioaerosol Pulmonary Deposition Using Mesh and Jet Nebulizers During Noninvasive Ventilation in Healthy Subjects. Respir. Care 2015, 60(9):1238-1246

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