



Volume Guarantee Ventilation in Neonates

Respiratory insufficiency remains one of the major causes of neonatal mortality and morbidity. By minimising lung injury, haemodynamic and neurological impairment and work of breathing whilst optimising comfort for the infant, you allow your little patients to grow safely with a higher chance of a positive long-term outcome. Volume Guarantee ventilation has been shown to improve the clinical outcome of neonates by reducing the number of respiratory and neurological complications as well as reducing the total duration of mechanical ventilation.

IMPROVING THE CONDITIONS FOR A BETTER START IN LIFE

The global Sustainable Development Goals target to reduce neonatal mortality to at least as low as 12 deaths per 1,000

live births¹. Newest evidence proves that there is still room for improvement to impact the outcome of newborns and neonates with the right ventilation strategies:

Infant Respiratory Distress Syndrome occurs in approximately 7 % of all preterm infants².

More than 60 % of ELBW infants develop Bronchopulmonary Dysplasia (BPD) with an oxygen dependency³.

There is a high risk (25 %) for poor long-term outcome for infants with BPD resulting in mortality rates as high as 14 % – 38 % [...] at 2 – 3 years of age^{4, 5, 6, 7}.

As the population of NICU survivors grow, long-term manifestations of chronic lung injury with BPD is likely to represent a greater burden to health systems⁸.

1. UNICEF: Child survival and the SDGs. 2017: <https://data.unicef.org/topic/child-survival/child-survival-sdgs/>

2. Hermansen CL, Lorah KN. Respiratory distress in the newborn. Am Fam Physician 2007;76:987-94.

3. Klingenberg C, Wheeler KI, McCallion N, Morley CJ, Davis PG: Volume-targeted versus pressure-limited ventilation in Neonates. Cochrane Database of Systematic Reviews 2017, Issue 10. Art. No.: CD003666.

4. An HS, Bae EJ, et al: Pulmonary hypertension in preterm infants with bronchopulmonary dysplasia. Korean Circ J. 2010; 40(3):131-6.

5. Kim DH, Kim HS, et al: Risk factors for pulmonary artery hypertension in preterm infants with moderate or severe bronchopulmonary dysplasia. Neonatology. 2012; 101(1):40-6.

6. Slaughter JL, Pakrashi T, et al: Echocardiographic detection of pulmonary hypertension in extremely low birth weight infants with bronchopulmonary dysplasia requiring prolonged positive pressure ventilation. J Perinatol. 2011; 31(19):635-40.

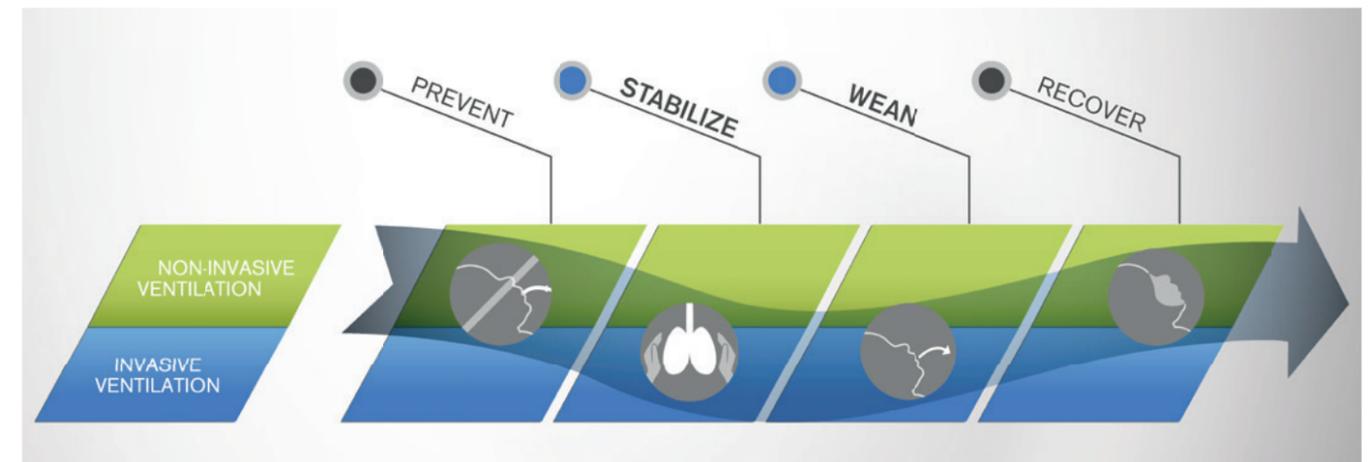
7. Khermani E, McElhinney DB, et al: Pulmonary artery hypertension in formerly premature infants with bronchopulmonary dysplasia: clinical features and outcomes in the surfactant era. Pediatrics. 2007; 120(6):1260-9.

8. Davidson LM, Berkelhamer SK: Bronchopulmonary Dysplasia: Chronic Lung Disease of Infancy and Long-Term Pulmonary Outcomes. J Clin Med. 2017; 6(1):4. 10.3390/jcm6010004.

STABILIZING THE VENTILATED INFANT

The aim of any ventilation strategy is to support the premature infant's respiratory system without inducing damage to the lung

or the brain. Volume Guarantee ventilation supports stabilization of the infant and gentle respiratory treatment with a more stable minute ventilation.

**RESPIRATORY PATHWAY IN NEONATAL VENTILATION**

Ventilation strategies - from preventing intubation to recover the infant to secure weaning and the development process - can be viewed as a continuum of dependencies that accompany the infant and the care giver from the beginning to the end of respiratory challenges as pictured in our respiratory pathway.

Ventilation in harmony with the infant with Volume Guarantee

Babies frequently demonstrate substantial variations in respiratory drive often on a breath-to-breath basis. Surfactant therapy can have a rapid and profound impact on compliance values⁹. Assuring the accurate delivery of tidal volumes during changes in compliance, resistance and leak volumes is a technically challenging prospect, but one that's well worth the effort. Scientific documentation has shown that strategies utilizing volume-targeted ventilation can significantly lower mean airway pressures and avoid complications such as overdistension, barotrauma and hypocarbia¹⁰.

Pressures adapt to individual changes in lung mechanics and respiratory drive whereas the tidal volume of the mandatory breaths remains constant. To prevent not only volutrauma but also barotrauma, the pressure can be limited to a maximum pressure (Pmax). The greater the patient's inspiratory efforts are, the lower the pressure the ventilator applies. The pressure load on the lungs is limited to the extend absolutely necessary.

MANDATORY MINUTE VENTILATION WITH VOLUME GUARANTEE

Mandatory Minute Ventilation (PC-MMV) is based on conventional PC-SIMV. It builds on the advantages of this mode including synchronization, Volume Guarantee and the pressure support of spontaneous and mandatory breaths. While in conventional PC-SIMV the mandatory rate is reduced manually to wean the patient off the ventilator, PC-MMV offers the benefit of weaning and transitioning the work of breathing from ventilator to patient seamless-

ly. This is supported by integrated Pressure Support and Apnea Ventilation. PC-MMV enables a more stable gas exchange, as the mandatory rate and pressures are continuously and automatically adjusted to secure a minimum level of minute ventilation – the key determinant of carbon dioxide removal from the lung. Integrated Volume Guarantee ensures that complications of excessive inflations such as pneumothoraces are reduced. When combined, scientific evidence suggest that these benefits can significantly reduce ventilation related time¹¹.

HIGH-FREQUENCY OSCILLATION WITH VOLUME GUARANTEE

High Frequency ventilation has shown to effectively manage oxygenation and especially CO₂ removal in critical patients. In order to prevent complications from hyper- and hypoventilation such as periventricular leucomalacia (PVL) and intraventricular hemorrhage (IVH) IVH, tidal volumes, pCO₂ and pH shall remain rather constant. By selecting Volume Guarantee in combination with PC-HFO, the oscillation amplitude is continuously adjusted to ensure the delivery of a pre-set volume. Thereby, High-Frequency Ventilation with Volume Guarantee stabilizes blood gases by compensating for dynamic changes in lung and breathing circuits.

SUMMARIZED: IMPROVED OUTCOME WITH VOLUME TARGETED VENTILATION STRATEGIES³

- Reduction of mechanical ventilation time compared to pressure limited ventilation by up to 2,36 days
- Decrease in the death or Bronchopulmonary Dysplasia (BPD) by 11 %
- Reduction in the incidence of Pneumothorax by 6 %
- Reduction of Periventricular Leukomalacia or Intraventricular Haemorrhage grade 3 - 4 by 8 %

WHAT EXPERTS SAY ABOUT VOLUME GUARANTEE

“Volume guarantee reduces the risk of inadvertent hyper-ventilation and lung injury due to excessive stretching of lung tissue. Volume guarantee also results in more stable minute ventilation, so that fewer blood gas determinations are needed. It is a self-weaning mode and has been shown to reduce the total duration of mechanical ventilation.”

Dr. Martin Keszler



Dr. Martin Keszler

Associate Director of the Neonatal Intensive Care Unit
Women and Infants Hospital in Providence, Rhode Island, USA

9. Jackson JC, Truog WE, et al: Reduction in lung injury after combined surfactant and high frequency ventilation. American Journal of Respiratory Critical Care Medicine 1994. 150(2):253-9, 1994.

10. Courtney SE, Durant DJ, et al: High-Frequency Oscillatory Ventilation versus conventional mechanical ventilation for very-low-birth-weight-infants. N Engl J Med 2002;347(9):643-52.

11. Claire N, Gerhardt T, et al: Computer-controlled minute ventilation in preterm infants undergoing mechanical ventilation. Journal of pediatrics 1997. Volume 131, Number 6; 3476(97)70042-8.



D-5755-2018

Babylog VN800



D-5755-2016

Babylog VN600



D-12081-2019

Evita V800



D-12080-2019

Evita V600

Not all products or features are for sale in all countries or are only available as an option.

Mentioned Trademarks are only registered in certain countries and not necessarily in the country in which this material is released. Go to www.draeger.com/trademarks to find the current status.

Learn more about neonatal non-invasive ventilation under www.draeger.com/neonatal-ventilation

CORPORATE HEADQUARTERS

Drägerwerk AG & Co. KGaA
Moislinger Allee 53-55
23558 Lübeck, Germany

www.draeger.com

Manufacturer:

Drägerwerk AG & Co. KGaA
Moislinger Allee 53-55
23542 Lübeck, Germany

REGION DACH

Drägerwerk AG & Co. KGaA
Moislinger Allee 53-55
23558 Lübeck, Germany
Tel +49 451 882 0
Fax +49 451 882 2080
info@draeger.com

REGION EUROPE

Drägerwerk AG & Co. KGaA
Moislinger Allee 53-55
23558 Lübeck, Germany
Tel +49 451 882 0
Fax +49 451 882 2080
info@draeger.com

REGION MIDDLE EAST, AFRICA

Drägerwerk AG & Co. KGaA
Branch Office
P.O. Box 505108
Dubai, United Arab Emirates
Tel +971 4 4294 600
Fax +971 4 4294 699
contactuae@draeger.com

REGION ASIA PACIFIC

Dräger Singapore Pte. Ltd.
25 International Business Park
#04-20/21 German Centre
Singapore 609916
Tel +65 6308 9400
Fax +65 6308 9401
asia.pacific@draeger.com

REGION CENTRAL AND SOUTH AMERICA

Dräger Panama S. de R.L.
59 East Street, Nuevo Paitilla,
House 30, San Francisco Town
Panama City, Panama
Tel +507 377 9100
Fax +507 377 9130
servicioalcliente@draeger.com

Locate your Regional Sales Representative at:
www.draeger.com/contact

