F&P Neopuff

T-Piece Resuscitation Therapy Overview

Fisher & Paykel HEALTHCARE

Key clinical benefits of T-Piece resuscitation[1-4]

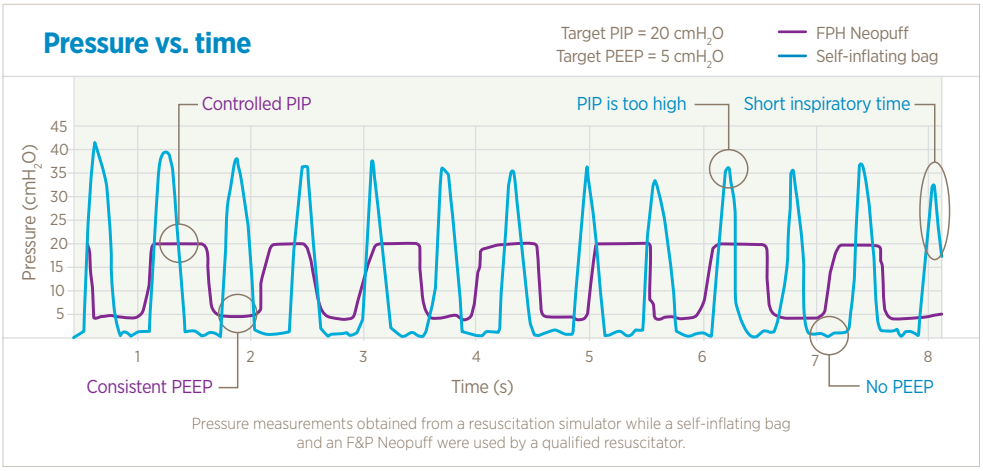
Deliver controlled and consistent pressures

- Helps protect lungs from injury
- Independent of operator experience
- Helps establish and maintain functional residual capacity

Promote normothermia by delivering heated and humidified T-Piece resuscitation

Deliver oxygen concentrations between 21% and 100%

Helps protect the lungs from injury by providing consistent and controlled PIP during resuscitation



Pressure measurements obtained from a resuscitation simulator while a self-inflating bag and an F&P Neopuff were used by a qualified resuscitator.

A T-Piece resuscitator can be used during neonatal resuscitation to provide consistent and controlled delivery of peak inspiratory pressure (PIP).[1] PIP is the maximum inspiratory pressure required to improve oxygenation without causing adverse effects.

Delivering a controlled PIP is important, as uncontrolled PIP that is too high may lead to lung injury, while under-inflating the lungs may not provide adequate gas exchange.

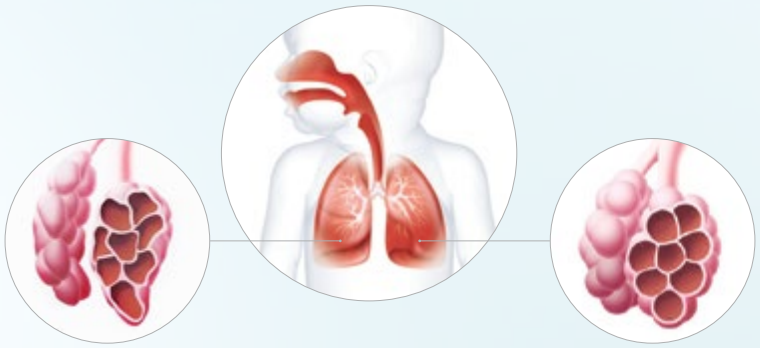
At birth, the lungs of preterm infants are uniquely susceptible to injury because they are structurally immature, surfactant-deficient, fluid-filled, and not supported by a stiff chest wall. Animal studies have demonstrated that lung injury can occur during resuscitation with just a few large manual inflations.[6,7]

"Target inflation pressures, tidal volumes, and long inspiratory times are achieved more consistently in mechanical models when using T-Piece devices than when using bags."

(European Resuscitation Council Guidelines for Resuscitation 2015)[5]

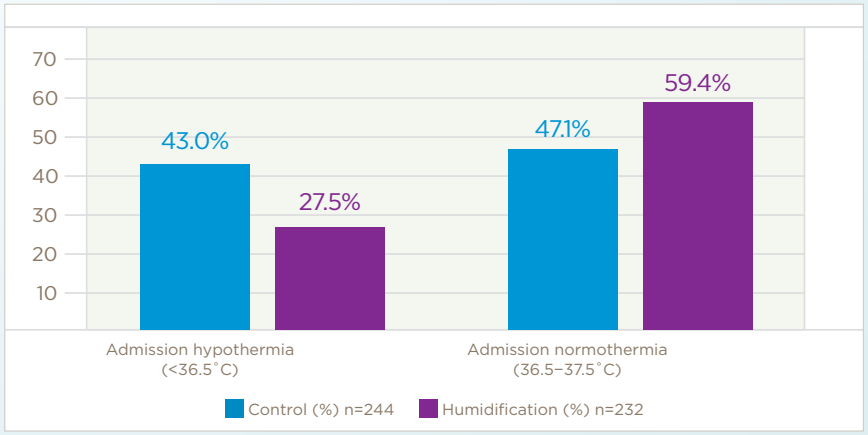
Establishes and maintains functional residual capacity by delivering consistent and controlled PEEP during resuscitation

Positive end-expiratory pressure (PEEP) is the residual pressure maintained at the end of expiration. A T-Piece resuscitator can be used during neonatal resuscitation to provide consistent and controlled delivery of PEEP. Resuscitation guidelines recommend delivering PEEP whenever positive pressure is required in the delivery room. Research has shown that providing PEEP when initiating ventilation may help to establish and maintain functional residual capacity (FRC) during transition at birth, improves the response to surfactant, and may also reduce delivery-room intubation rates and the incidence of lung injury.[3, 8-10]



Effect of PEEP on lung volume and alveoli. On the left, lung and alveoli under respiratory distress without PEEP. On the right, lung and alveoli with PEEP.

Heated and humidified T-Piece resuscitation promotes normothermia



Heating and humidifying inspired gases for early stabilization of preterm infants resulted in a lower rate of hypothermia and a higher rate of normothermia on admission to the NICU when compared with no heating and humidification of inspired gases (control group).

Adapted from Meyer, M. P. et al. Front. Pediatr. (2018).

Newborn infants are exposed to heat loss immediately following birth. The maintenance of body temperature within the range 36.5 to 37.5°C is essential, with hypothermia or hyperthermia being associated with an increased risk of neonatal mortality and morbidity in both preterm and term infants. Humidified resuscitation is a method of delivering warm, humidified gas to an infant during ventilatory support at birth. A meta-analysis found that the use of heated and humidified T-Piece resuscitation in the delivery room resulted in significantly more infants with normothermia on NICU admission, compared with the use of cold, dry gas.[4]

Delivering T-Piece resuscitation using the Neopuff™ T-Piece Resuscitation System

Humidified setup

Resuscitation device

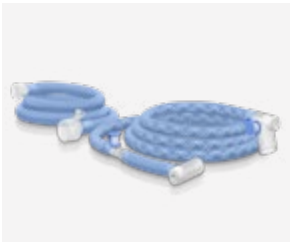
Neopuff (RD900 series)

Humidifier

Humidifier (MR850)
+ Chamber (MR290/MR225)

T-Piece circuit

Humidified Circuit
(900RD110)



Resuscitation mask

Resuscitation Mask
(RD803(XS); RD804(S);
RD805(M); RD806(L);
RD807(XL))

Non-humidified setup

Resuscitation device

Neopuff (RD900 series) or
other T-Piece resuscitator*

* T-Piece resuscitator that meets the gas-powered resuscitator standard (ISO 10651-5:2006)

T-Piece circuit

Ergonomic T-Piece Circuit
(RD1300)

Classic T-Piece Circuit
(900RD010)

Resuscitation mask

Resuscitation Mask
(RD803(XS); RD804(S);
RD805(M); RD806(L);
RD807(XL))

References: 1. Roehr, C. C. et al. Manual ventilation devices in neonatal resuscitation: Tidal volume and positive pressure-provision. Resuscitation 81, 202–205 (2010). 2. Roehr, C. C., Kelm, M., Proquitté, H. & Schmalisch, G. Equipment and operator training denote manual ventilation performance in neonatal resuscitation. Am. J. Perinatol. 27, 753–758 (2010). 3. Boon, A. W., Milner, A. D., Hopkin, I. E. Lung expansion, tidal exchange and formation of the functional residual capacity during resuscitation of asphyxiated neonates. J. Pediatr. 95, 1031–1036 (1979). 4. Meyer, M. P., Owen, L. S. & Te Pas, A. Use of heated humidified gases for early stabilization of preterm infants: a meta-analysis. Front. Pediatr. 6, 319 (2018). 5. Wyllie, J. et al. European Resuscitation Council Guidelines for Resuscitation 2015: Section 7. Resuscitation and support of transition of babies at birth. Resuscitation. 95, 249–263 (2015). 6. Björklund, L. J. et al. Manual ventilation with a few large breaths at birth compromises the therapeutic effect of subsequent surfactant replacement in immature lambs. Pediatr. Res. 42, 348 (1997). 7. Hillman, N. H. et al. Brief, large tidal volume ventilation initiates lung injury and a systemic response in fetal sheep. Am. J. Respir. Crit. Care Med. 176, 575–581 (2007). 8. Hartog, A., Gommers, D., Haitsma, J. J. & Lachmann, B. Improvement of lung mechanics by exogenous surfactant: effect of prior application of high positive end-expiratory pressure. Br. J. Anaesth. 85, 752–756 (2000). 9. Michna, J., Jobe, A. H. & Ikegami, M. Positive end-expiratory pressure preserves surfactant function in preterm lambs. Am. J. Respir. Crit. Care Med. 160, 634–639 (1999). 10. Gittermann, M. K., Fusch, C., Gittermann, A. R., Regazzoni, B. M. & Moessinger, A. C. Early nasal continuous positive airway pressure treatment reduces the need for intubation in very low birth weight infants. Eur. J. Pediatr. 156, 384–388 (1997).

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